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ABSTRACT

A survey of 501 Wisconsin firms (260 responses) assessed the impact of changes in demand, productivity, and technology on the employment needs and training requirements of Wisconsin employers in 10 selected economic sectors. Major findings included the following: (1) Wisconsin's services sector has recently experienced major employment growth and will continue to do so, requiring more training for nurses, medical technologists, nurses' aides, and computer programmers; (2) although manufacturing has grown less than the services sector, skill requirements for some manufacturing jobs have changed; (3) the occupational preparation of most new entrants is above average, but only a few workers were described as "very well prepared"; (4) new technology will not drastically change skill requirements, although basic and technical components need to be upgraded; (5) employers emphasize the need to train employees in the technology-oriented occupations; and (6) employers prefer on-the-job and in-house training to that offered by vocational-technical education. The report provides information on employment growth and training needs for these fields: hospital industry; nursing and personal care facilities; personnel supply services; computer programming, data processing, and other computer-related services; accident and health insurance and medical services plans; computer and office equipment; electrical transmission and distribution equipment manufacturing; electrical industrial apparatus; communications equipment industry; and engineering, scientific, and research instruments industry. Appendixes consist of the survey questionnaire and staffing patterns of surveyed industries; 14 tables and 35 references are included. (KC)

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EFFECTS OF STRUCTURAL CHANGE ON LABOR SUPPLY
IN WISCONSIN

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SUMMARY AND CONCLUSIONS

I. Situation

Changes in consumer and business demand and productivity have shifted employment in Wisconsin from agriculture to manufacturing and eventually to services. Technological diffusion has and continues to alter skill requirements of jobs and redistributes occupations within sectors as well as across sectors. These major structural changes combine with other changes such as labor force composition, often resulting in situations where Wisconsin employers experience increasing imbalances between skill requirements and available skills.

For Wisconsin employers to remain competitive in this century's last decade while meeting the challenges of the 21st century, workers' skills must be developed to synchronize skill availability with skill requirements. For the educational system to teach the skills needed by business and industry requires a periodic assessment of available skills and required skills. This evolving assessment is crucial to formulating effective training programs.

This study was conceived in response to the ongoing need to assess skill requirements and available skills. The study builds on two major premises. (1) Types of jobs in the economy and their corresponding skill requirements are determined both by existing economic sectors and available technology. (2) Employment and skill changes have both quantitative and qualitative dimensions. A skill gap may arise because of a shortage of workers in a particular skill position (i.e. quantity gap). A skill gap may also reflect current employees' skill deficiencies resulting from changes in the actual content of jobs (i.e., quality gap).

This study seeks to answer these broad questions:

a. What type of occupational changes are occurring in Wisconsin businesses and industry?

b. How prepared are Wisconsin workers for existing as well as emerging jobs.

c. How have basic or technical skill requirements of Wisconsin business and industry changed because of new technology?

d. How do training needs differ between smaller and larger firms?

e. How do training needs differ between rural and urban Wisconsin?

f. What training methods do Wisconsin employers prefer for developing and maintaining the needed skills?

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II. Major Findings And Conclusions

While the VTAE system has long tradition of working with Wisconsin firms, the need to strengthen that linkage remains critical. The evidence here suggests that the rapidly changing content of jobs, the relatively high incidence of 'own-in-house formal training' and concern about occupational prepartion of several occupations indicates a crucial need the VTAE system can fulfill.

A. Employment And Occupational Changes

According to the survey results, phenomenal employment increases took place in the services sector between 1987 and 1988. Further employment increases in this sector are expected in 1989. Occupations that posted most of the new jobs in 1988 will likely dominate new 1989 positions as well.

The hospital sector and the personnel services sector are the two industries witnessing the highest employment growth between 1987 and 1988. Employment in these two sectors increased more than 25 percent over 1987-88. Most new jobs in the hospital sector in 1987-88 went to registered nurses and nurses aides, and employers expect this employment growth to continue. Registered nursing and medical clinical laboratory technologists posed the greatest difficulty in finding qualified personnel. In the personnel services sector most new jobs went to employment interviewers. There were, however, minor declines in employment for bookkeeping and accounting clerks.

Some occupations experienced high growth in the nursing and personal care facilities and computer programming, data processing, and other computer related services. Nurses aides added more than half of all new jobs in the personal care facilities sector, and will likely continue to grow in 1989. In the same sector, employment growth for registered nurses was also high over 1987-88. In the computer programming, data processing, and other computer related sector employment growth for computer programmers over 1987-88 exceeded 20 percent. In 1989, employment for computer programmers is expected to continue.

In the manufacturing sector, some industries gained in employment, some suffered employment declines, and some did not change. In the electrical industrial apparatus manufacture sector employment growth over 1987-88 for the selected occupations was higher than for all the service producing firms surveyed except hospitals. Meanwhile, engineering and laboratory equipment manufacture and electrical transmission and distribution equipment manufacture also expanded. In other manufacturing industries, such as communications equipment manufacture, and computer and office equipment manufacturing, employment declined during 1987-88.

Blue collar occupations such as coil winder, tapers, and finishers posted most of the new manufacturing sector jobs. Professional occupations such as electrical and electronic engineers and technicians fared well in industries that experienced significant employment growth, but suffered layoffs in declining industries. Drafters fared poorly in both the growing and declining industries in 1987-88 and survey results indicate more lay-offs are expected in 1989.

The main conclusion is that while major employment growth took place and will continue to take place in the services sector, some manufacturing sectors also added new jobs. Consequently, even though training programs for service related jobs need expansion, training programs for manufacturing jobs cannot be ignored. Declining employment in certain occupations does not conclusively suggest reduced training in those occupations. For instance, employment declines for drafters may indicate a reduction in the quantitative dimension of drafters, yet may disguise an actual increase in the qualitative dimension of drafters. Drafters' job content (i.e., skills) have changed because of the greater use of computer aided design technology.

The implication of such a finding for policy makers and educators is that though declining occupations may signal the need to curtail the number of training programs for such occupations it may also directly signal a need to change training program content. New training programs must reflect changing job skill requirements. These changing job skill requirements places an additional burden on vocational education sources. The more obvious indicators of educational needs may give erroneous signals, and educators need to strengthen linkages with employers to accurately and adequately meet evolving training needs. Occupations with declining numbers and changing content means mechanisms for delivering training need to be reviewed and alternatives examined.

B. Occupational Preparation Of Workers

Occupational preparation of new hires was measured on a scale ranging from 0 (not well prepared) to 4 (very well prepared), and new hires in most occupations were above the average of 2. At the upper end of the preparation scale were occupations such as registered nurses, licensed practical nurses, medical/clinical laboratory technologists, secretaries, computer programmers, bookkeeping and accounting clerks, insurance adjusters, insurance claims clerks, electrical and electronic engineers and technicians, drafters, and welders and cutters. At the lower end of the preparation scale are insurance sales clerks, machine assemblers, machine feeders and offbearers, and coil winders, tapers and finishers. Even though most occupational preparation ratings are above the average, only licensed practical nurses (in personnel services) and electrical and electronic technicians (in the engineering and laboratory research instruments manufacturing) were rated above 3.5. These figures show that most new hires in the state are not "very well prepared"

We may conclude that even though most new hires are above the average occupational preparation rating some still have very low ratings. There is a need to improve workers' occupational preparation. While examined only indirectly, this potential for improving worker preparation has significant direct implications for worker productivity and the competitive position of Wisconsin firms.

C. Changes in Skills Because Of New Technologies

Two general types of skills were measured: basic skills and technical skills. Basic skills refer to basic mathematics, science, reading and writing. Technical skills refer to mental, manipulative, and interpersonal skills. Employers in the selected occupations were asked to indicate whether new technologies have increased, decreased, or not changed the basic or technical skills of their workers.

The results indicate that in general, technological change has not greatly altered the basic skill requirements of workers. In 71 percent of the occupations surveyed over 50 percent of respondents reported no change in basic skill requirements. Increases in basic skills were reported more than decreases were. Employers reported increases in basic skills in 69 percent of the occupations surveyed. In a third of the occupations with recorded skill increases, 40 percent or more of employers believed skill level had increased. For 68 percent of the occupations surveyed, no employer reported any decrease in basic skills resulting from new technology. Meanwhile, only a small proportion of the employers reported a decrease in basic skills. Correspondence clerks (in the accident and health insurance and medical service plan sector) was the only occupation with as many as half of all employers reporting an actual decrease in basic skills required. In all other occupations 25 percent or fewer of the reported employers decrease in basic skills. This indicates that new technology will not appreciably change the basic skill requirement of workers. As may be expected, however, the tendency is for basic skills to increase rather than decrease.

Survey responses also indicate that new technology has not appreciably changed technical skills requirements. Employers reporting no change in technical skills consistently amounted to fewer than those reporting no change in basic skills. Meanwhile in most occupations employers reporting increases in technical skills also exceeded the proportion reporting increases in basic skills. Declines in technical skills were reported in fewer occupations than were declines in basic skills. Moreover, employers reported declines in technical skill needs than basic skill needs.

To date there is no convincing evidence that technical skill requirements have increased because of new technologies. Yet the predominate tendency is towards increasing technical skill requirements. The impact of technology is not confined to technical skills alone, and a need to also improve workers' basic skills is reflected in employers' increasing interest in formal in-house training programs.

This finding implies that even though the diffusion of technology does not call for a complete training system overhaul it nevertheless requires upgrading basic skills as well as increased technical training. This is because of technology's positive impact on both basic and technical skill requirements of workers in most occupations and the complementary nature of the two skill types.

D. Training Needs by Size of Firm

Survey responses generally indicated that larger firms were more concerned than smaller firms about the need to train current employees. This may reflect the sophistication of their human resource development efforts, since the larger firms were more frequently engaged in their own formal training programs. This suggests that training and retraining by outside providers can fill a niche for the smaller firms that have been the recent source of Wisconsin employment growth. It is recognized that these will be relatively expensive to conduct because of limited enrollment. Alternative delivery mechanism (e.g., video conferencing), however, could reduce these costs.

E. Training Needs by Firms Location

The rural/urban location of firms yielded mixed results in terms of training needs and occupational preparation. The difficulty in interpreting the data is characterized by registered nurses in the hospital (SIC

806) and personal care (SIC 805) sectors. Relatively more of the rural hospitals felt current RNs needed training, while relatively more of the urban personal care facilities felt RNs needed more training.

The need to devise mechanisms to deliver vocational education programs in a cost efficient manner to widely scattered rural firms requires attention by the vocational education system. Several respondents noted in the open ended questions the perceived concentration of programs in the larger urban areas and southern portion of Wisconsin.

F. Worker's Training Needs and Employers' Training Preferences

In general, employers expressed a greater need for training/retraining workers in occupations related to technology than for those in less technology-related occupations. In the hospital industry for instance, registered nurses and medical clinical laboratory technologists were the most frequently cited as requiring additional training. Some of the occupations cited in other industries include computer programmers, computer system analysts, insurance sales workers, electrical and electronic engineers and technicians.

This training need suggests that employers emphasize supplemental training of those occupations that are core to their operations. Training workers in these occupations is essential to keeping the firms competitive. Unfortunately, the desire to remain competitive may lead to the training neglect of workers in the less technology-oriented occupations. For example, food preparation workers in the hospital industry had relatively low levels of occupational preparation yet were not cited by employers as priority training targets.

Employers preferred on-the-job training or own in-house training over training by outside organizations like the VTAE system. This preference has several implications. It may indicate that employers are not sufficiently informed about the programs offered by either VTAE or other outside educational organizations. It may also indicate that employers are dissatisfied with current training offered by the VTAE system and other outside organizations. Dissatisfaction may include costs of training, a inferior quality of training, or unsatisfactory training center location.

If employers are unaware of training offered by VTAE system then an opportunity exists for the VTAE system to expand current programs and extend programs to new firms. Future efforts to increase employer involvement in training program content will directly address part of the quality concern. The concern about proximity directly refers to getting training closer to rural employers, who reported a concentration of workshops and training sessions in Madison, Milwaukee, and other urban areas throughout the state. Training sessions are needed in rural Wisconsin.

III. Summary

The major findings of the study are summarized as follows:

1. Wisconsin's services sector has experienced major employment and occupational changes in the recent past. These changes will likely persist in the near term. Consequently, more training programs will be required for many service sector jobs, including registered nurses, medical clinical laboratory technologists, nurses aides, and computer programmers.

2. Even though manufacturing employment has generally grown less than the services sector, some manufacturing jobs have also witnessed changes, especially in their skill requirements. While the need for more training programs in the manufacturing sector may be lower than that in the service sector, there is nevertheless a need to upgrade the content of training programs for many manufacturing jobs.

3. The occupational preparation of most new entrants are above average. This suggests that the training institutions are producing the workers required to help Wisconsin employers become and remain competitive. However, only a few workers were described as "very well prepared." In a highly competitive global economy, Wisconsin employers obviously need more of the "very well prepared" to effectively meet the challenges ahead.

4. New technology will not drastically change worker's skill requirement. However, there is an indication of increased and probably different basic and technical skill requirements. This requires upgrading both basic and technical components of training curricula. Workers' mental, manipulative, and interpersonal skills should be developed further, as well as their basic mathematics, science, reading, and writing skills.

5. Employers generally emphasize the need to train employees in the technology- oriented occupations to the neglect of less technology-oriented occupations. However, many of the less technology-oriented occupations are ill-prepared. Consequently, future training strategies cannot ignore training programs to improve the skills of workers in such occupations.

6. Employers prefer on-the-job training and own in-house training to training offered by outside organizations such as the VTAE system. This preference may reflect insufficiently available information and a seemingly high cost of training, especially for small or rural employers who are far from training programs. As

a result there is a continuing need to expand the coverage of training programs geographically as well as in terms of skills.

IV. Caveates and Suggestions for Future Research

The limitations of the study have both conceptual and methodological dimensions. This study implicitly assumes that technological change is discrete and that it is possible to identify the effects that flow from this well defined event. Even though this assumption derives from theoretical discussions on technological change, nevertheless the survey evidence does not support this view. Technological change is an on-going process involving new and varied equipment, products and processes. The effect of technology is thus continuous and precludes a singular identifiable impact on skill or employment. Thus identifying a particular technology and assessing its impact yields limited insight. The problem becomes worse in situations with more than one identified technology. When it becomes unclear to employers which technology affects which occupation. As a result many employers did not answer the questions about technology and its impact on skills. Thus the responses to the questions on the effect of identified technology upon skills and training must be interpreted with caution.

Another conceptual limitation of the study derives from the assumption of technological determinism. The study assumes, like most studies structural change and its impact on labor requirements [Spenner, 1979; Rumberger, 1984; Peithinis, 1978], that skills are attributes of jobs rather than attributes of the individuals. Employers hire workers and mold them to the jobs, rather than the individual molding the job to suit his/her skills. However, identifying the numerous characteristics of the labor force in an assessment of the imbalance between skill requirements and available skills may offer useful insights. The education-age profile, and other demographic characteristics of the labor force are important in determining the skills available within the community [Becker, 1975].

Financial constraints caused the major methodological limitation of this study and permitted only the use of a direct mail questionnaire in gathering the information. This limitation is reflected in the rather poor response rate of 51 percent, of which only 44 percent were useable. The non-responses to many individual questions further reduced the useable response rate. Responses in the manufacturing sector were particularly low, and meaningful analysis was impossible in some industries.

Another limitation of the instrument was the rigidity normally associated with questionnaires. This was particularly evident regarding the technology question. Many firms did not answer on the pretext that they had not introduced any of the new technology specified in the past two years. The technology change question was unable to distinguish process change technology and its effect on skills. The combination of a mail survey and a face-to-face interview with more open-ended questions would likely garner more detailed information on technological change. A follow up telephone discussion to clarify issues is also recommended.

CHAPTER 1

INTRODUCTION

A dynamic economy is constantly altering its use of capital and labor in response to changes in consumer demand, resource supplies, and shifting technology. These changes have particular impact on the labor force especially its current and emerging skill requirements. For an economy to maintain its dynamism, continual assessment of the impact of these changes is required in order to ensure the availability of qualified labor force.

The widespread impact of the shift in demand structure and consumer spending, income growth, changes in productivity, and rapid diffusion of technology on work in the nation's offices, factories, hospitals, and farms is well documented [Hall, 1979; Lilien, 1982; Baran, 1987]. Ever larger numbers of workers are using new technology that require new and different skills. Employment in new technology-oriented sectors is increasing rapidly at the expense of more traditional jobs in stagnating or declining sectors [Rumberger and Levin, 1984]. Consequently, while more new and different skills are being utilized, some traditional skills are becoming obsolete. New jobs are emerging, some existing jobs are being transformed, while other jobs are being displaced. The dynamics of the economy pressure firms and workers to maintain and/or acquire the skills required to carry out production.

The current transformation of work is part of an ongoing process dating back to the industrial revolution. While the industrial revolution reduced labor requirements in farming and transformed factory work, current rapid developments in microelectronics, biological sciences, and other high technology fields are transforming work, or they promise to do so in almost all sectors of the economy and within all occupational categories. The transformation of work and skill requirements have the potential to induce labor market adjustments that produce mismatches between skill availability and skill requirements. For these reasons, periodic assessments of employment needs and training requirements is necessary to address these imbalances.

The assessment of employment needs and training requirements is important to employers, workers, and communities. Workers need to know what skills that they must possess to be competitive in the labor market. Employers must know the skill mix available in the community to determine what production techniques to use in their operations. The community and its educational institutions require information on employment needs to facilitate labor market adjustments and ensure adequate supplies of goods and services to its people.

The effects of on-going structural changes on employment and skills is not fully understood and this makes prediction of future labor market a difficult task. Still, something must be done now to prepare future workers for entry into the labor force and keep current workers productive. The dynamics and uncertainty of these changes place a burden on the educational system to anticipate the future labor market in order to determine training requirements, plan training programs, organize the equipment and facilities, and hire instructors needed to provide training. This requires educational and training policy-makers to anticipate which occupations will emerge, which will grow or decline, and which skills are needed in the emerging occupations, all of which are essential in formulating programs.

This study seeks to assess the impact of shifts in demand, changes in productivity, and technological change on the employment needs and training requirements of Wisconsin employers in selected economic sectors. The study tests the widely-held belief that a mismatch exists between skill availability and skill requirements in Wisconsin.

The contention will be tested by finding out whether Wisconsin employers are able to obtain the skills they need for their operations which in turn provide the goods and services people demand. Specifically, answers to the following questions will be sought:

1. Does the present pool of workers possess the skills needed by employers?
2. Are there occupations undergoing change that will alter the skills needed?
3. How can training help to improve the match between skill requirements and available skills? Who needs training? What types of training can be effectiely used to provide these skills?

In the balance of this study we report the results of a late 1988 survey of 501 Wisconsin firms spread across 10 sectors. The results give insight to the preparation of workers, type of training preferred by employers, and the impact of new technology on job skills. This information should be useful to the significant decisions required to create the workforce needed to keep Wisconsin firms competitive in an increasingly turbulent and global market.

The next section briefly reviews the sources of occupational change. That is followed by a synopsis of the data collection procedures. The major part of the document summarizes the responses, by sector, to the survey instrument.

I. SOURCES OF STRUCTURAL CHANGE AND THEIR IMPACT ON EMPLOYMENT AND SKILLS

The turbulence in the labor market arises from several sources: change in demand for products; changes in productivity; emergence of new products and competitors; changes in the education and training of workers and in the skills required by employers; changes in location of markets, workforce, population; and the introduction of new technology. This report will limit its attention to the following three sources: changes in demand, productivity, and technology. The labor market turbulence these and other sources of change cause appear as changes in general employment among sectors, as changes in specific occupations within sectors, and as changes in the skills required for specific jobs to name a few. These changes affect firms, employees, educational institutions, and communities.

A. Demand Shifts as Source of Structural Change

Shifts in demand patterns have affected employment distribution across sectors of the U.S. economy. In 1940 for example, 40 percent of personal consumption expenditures in the U.S. went for services whereas in 1988 almost half (49 percent) of consumption was in services [U.S. Council of Economic Advisers, 1989]. Other components of demand (i.e., investment, imports, and government purchases) have also shifted over the period. As a result, employment in some sectors of the economy, primarily those in the service-producing sectors, have grown faster than others.

The differences are striking. Employment growth in services sector between 1946 and 1988 was 234 percent compared with 34 percent in manufacturing. Even though the relatively low growth in factory jobs had been going on over the entire period, it became very significant after 1979. In 1979 total manufacturing employment peaked at about 21 million. By the end of the 1981-82 recession about 2.8 million manufacturing jobs had been lost [Personick, 1988]. Since 1982, there has been a partial come-back although full recovery has not been achieved. Meanwhile, employment growth in the services sector continues.

According to Bureau of Labor Statistics' projections, employment in the services sector will constitute about 80 percent of all wage and salary employment by the year 2000 adding more than 20 million new jobs.

In contrast to the projections for the U.S., the employment growth rate in Wisconsin manufacturing will not decline but neither will it grow as fast as in the services sector [DILHR, 1987]. According to the DILHR mean projections for 2000, employment in manufacturing will increase from 526,400 in 1987 to 547,100 in 2000, an increase of 3.9 percent. Manufacturing will continue to add more new jobs, but at a much slower rate than the services sector, where employment is projected to increase more than 26 percent, from 454,900 in 1987 to 575,100 in 2000.

This source of change reflects major shifts in demand of both businesses and consumers for output. Its consequences affect the relative employment across sectors of the economy.

B. Productivity As Source Of Structural Change

Differences in productivity have also affected employment growth among sectors in the nation. Between 1947 and 1987 manufacturing output increased by 271 percent, almost the same rate of growth as the whole economy. Yet, manufacturing employment increased by only 34 percent because of productivity improvements. [U.S. Council of Economic Advisors, 1989.] In contrast, productivity in services remained constant over the period. As a result employment growth in the sector matched growth in output. In agriculture, high productivity growth resulted in a 60 percent decline in employment, even though output increased by 72 percent over the 1947-87 period. Different productivity levels across sectors yield different employment growth rates even with similar output growth rates.

While changes in productivity affect the employment of all occupations within an industry, they may also change the occupational composition of employment within an industry while leaving total employment unchanged. Despite the projected decline in U.S. manufacturing employment due to productivity growth, it is projected that employment in engineering, scientific and technical occupations in manufacturing will gain about 258,000 new jobs between 1986 and 2000 [Personick, p 31]. In Wisconsin, six of these technical occupations namely, electrical and electronic engineers, mechanical engineers, electrical and electronic technicians, computer system analysts and computer programmers were projected to add 2,450 new jobs between 1985 and 1995 [DILHR, 1987].

Productivity growth reflects changes in output per unit of labor, resulting from the substitution of factors of production among themselves. Its impact affects the relative distribution of employment across sectors and occupations within sectors.

C. Technology Diffusion as a Source of Structural Change

While demand shifts and productivity increases generally impact employment at the industry level, diffusion of technology alters the distribution of employment and skills across occupations within industries.

Technology diffusion involves the introduction of innovative products and production processes. A number of factors interact to influence how technology diffusion affects the level of employment. These include the size and rate of growth of the domestic and international markets for the new product, the size of any changes in labor requirements, the magnitude of changes in output prices resulting from more extensive use of the technology, and the expansion or contraction in other industries in response to changes in the cost of key inputs [Cyert et al., 1987]. These variables exert offsetting influences on the demand for labor within industries, making a complete accounting of all their effects on employment difficult. This difficulty prevents the establishment of aggregate trends as was done for the two other sources of structural change. Consequently, the effect of technological change on a single industry or the impact of single technologies on many industries is used here to illustrate technological diffusion as a source of structural change.

A survey of 200 studies of the employment effect of process innovations on employment during 1940 and 1982 suggests that process innovation in skill-intensive manufacturing processes often eliminated high-skill jobs and generated low skill jobs [Flynn, 1985]. The same study also reported that the adoption of data- and word-processing technologies in offices eliminated low skill jobs and created high skill jobs. The results of these studies suggests the offsetting influences of technology on employment and skills. In another study by Denny and Fuss [1983], the effect of technology diffusion on employment between 1960 and 1980 in five manufacturing and mining industries suggested a substitution of capital for labor.

In addition to its impact on employment new technology requires new and different skills. There is a great public concern about the effects of technology diffusion on basic skills requirements as well as job-related skills of workers [Cyert et al., p. 99]. Basic skills are typically acquired prior to entering the labor force. They consist of literacy, problem solving, numerical reasoning and written communications competence. Workers usually acquire basic skills through the public and adult educational system rather than through employers. Job-related or specific technical skills historically have been provided by employers. The two types of skills are complementary. Basic skill training helps workers in learning what they need to do in their jobs [Bishop, 1984]. Some experts believe that the introduction of new technology reduces the basic and technical skill requirements needed by workers [Flynn, 1985]. Others argue that introduction of new technologies increases skills required by most workers [Hirschhorn, 1984; Baran, 1986]. Evidence on the effect of new technology on skills is, however, fragmented and gives mixed results. However, experts agree that new technology requires new and different skills. Whether these new skills are higher or lower is the crux of the debate.

Technological change affects the distribution of employment and skills to occupational categories within industries. The direction of effect, on skill requirements is, unclear.

Having identified the major sources of structural change we now outline the conceptual framework that will guide the study in assessing the impact of these forces on Wisconsin employment and skills.

II. SCOPE OF THE STUDY

The conceptual framework guiding the study builds on two premises. The first focuses on skills as attributes of jobs rather than as attributes of the worker. This view of skills recognizes the types of jobs in the economy as technologically determined. Employers mold workers through the hiring and training process in order to meet the job requirements which are determined by the tasks associated with the job [Doeringer and Piore, 1971; Thurow, 1975]. The concept of skill used in this sense is synonymous with job requirements. The second premise is that the training needs of employers depend on the distribution of workers among occupational groups as well as changes in skills required to perform jobs within an occupational group. Employment and skill changes are, therefore, conceptualized in two dimensions. The first, a quantitative dimension, is concerned with the number of workers involved. The second, a qualitative dimension, is concerned with the complexity of the actual work.

III. SUMMARY

This chapter identified three main sources of structural change: changes in consumer and business demand; changes in productivity, and changes in technology. Shifts in demand and changes in productivity have shifted employment from agriculture to manufacturing and eventually to services. Technological change has altered skill requirements and redistributed employment and skills across occupations within industries. The effects of the three sources of change are not independent, and interact to affect employment and skills across and within industries and occupations

The study is based on two premises. The first is that the types of jobs in the economy and their skill requirements are determined by the available technology. The second is that employment and skill changes have both quantitative and qualitative dimensions.

The broad questions to be answered by the study include the following:

a. What type of occupational changes are occurring?

b. How prepared are workers for existing and emerging jobs?

c. Have basic or technical skill requirements changed or likely to change because of diffusion of new technologies?

d. Are training needs greater in smaller firms or in larger firms?

e. Are there differences in training needs in rural or urban areas?

f. What training methods are preferred by employers?

CHAPTER 2

DESIGN AND METHODOLOGY

In the preceding chapter, the main sources of structural change and their impact on employment and skills were identified and the general questions to be answered were also outlined. This chapter provides a detailed account of the information used to answer those questions. The account entails a description of the information used and where it was obtained. In the first section we discuss the sources of information and the questionnaire used in gathering the information. This discussion also includes the conceptual basis of the information collected. The second section discusses the sampling procedure. The final section presents the response rate.

I. THE SOURCE OF INFORMATION AND QUESTIONNAIRE USED

The findings reported in this paper are based on responses to mail questionnaires sent to selected employers in the manufacturing and service industries scattered in 51 Wisconsin counties. The questionnaire solicited information about the employment needs and skill requirements of employers in specific occupations in selected industries. The questionnaire is presented in Appendix I while the list of occupations is reported in Appendix II.

The questionnaire consists of six parts. Part I requests general information about the employer or respondent and the total number of workers employed in the location. Part II asks questions about changes in the labor force. Part III identifies the occupational preparation of employees and the method of recruitment used by the employer. Part IV seeks information about the availability of qualified personnel. Part V requests information on the effects of new technologies on skills. Finally, Part VI seeks information on workforce adaptation.

While the questions are essentially the same for all industries, they focus on occupations and technologies specific to individual sectors. The technologies included in the questionnaire are current innovative materials, processes, and equipment used in the operations of the industry. They were identified from the 1987 U.S. Industrial Outlook prepared by the U.S. Department of Commerce. [U.S. Department of Commerce, 1987]

In the following paragraphs, the questionnaire is described in detail and the conceptual basis of the questions are outlined.

Part I of the questionnaire seeks information about the number of workers a firm currently employs and the position of the person responding to the questionnaire. The information on firm employment size gives an indication of firm size. It permits a comparison of employment and training needs across firm sizes.

Part II of the questionnaire seeks information about changes in employment level for the selected occupations between 1987 and 1988 and the expected changes in 1989. This assesses the short run quantitative dimension of employment changes across occupations. For instance, was there a shift of employment from one occupation to the other between 1987 and 1988? If so, which occupations and how many workers were involved.

Part III of the questionnaire asks about the occupational preparation of newly hired workers and the methods used in recruiting them. This seeks to find out whether the real or potential mismatch between skill requirements and available skills is due to improper training of new hires (i.e., poor occupational preparation). The question on recruitment method attempts to find out whether the mismatch is related to insufficient search by employers. In sum, this section seeks data to distinguish if skill mismatches are due to structural changes rather than factors such as insufficient search and insufficient training.

Part IV seeks information about the difficulty in hiring qualified people. It also tries to find out how such difficulties are resolved by employers. The question about difficulty in hiring qualified people intends to determine which occupational skills are in short supply. The methods used in resolving the problem also give some insight into the reasons for the shortage. For instance, if wage raises were often used in resolving hiring difficulties, then, the shortage would obviously not be due to a mismatch between skills. However, if the difficulty resulted in an expansion of training or redesign of jobs then the possibility of a mismatch exists.

Part V seeks answers to the reason why employers introduce new technologies. It also finds out whether introduction of technology affects the basic and technical skills of workers. In order to do that some new materials, processes, and equipment technologies specific to industries were identified from the U.S. Department of Commerce's 1987 Industrial Outlook report and included in the questionnaire. Employers were given the option to add new technologies introduced but not included in the questionnaire. The question on the reason for introducing technology seeks to find out if technologies are introduced in order to make simplier, complex jobs for which there are no qualified people to do so that less qualified people could do.[1/] The question about the effect of technology introduction on basic and technical skills assesses the qualitative dimension of employment (skill needs). This skill change may induce a mismatch between the new skills required and the skills possessed by current employees.

The final part asks questions about training and retraining needs of workers in the selected occupations, the training methods important in maintaining workers skills, and how satisfied employers are with training programs. This part seeks information about occupations which require training because of real or potential imbalance between skills of workers and job skills required. The part also gives some insights into the training methods preferred by employers and also employers' preference about the organizations that offer training.

II. SAMPLING PROCEDURE

The sampling of industries, occupations, and firms to be surveyed involves four stages to ensure that employment and skill changes by industry and occupation are both considered. The stages are described in the following paragraphs.

A. Stage I - Listing of prospective Industries

The DILHR 1987 publication, "Monthly Employment Covered by Wisconsin U.C Law", was used in the preliminary industry selection. The document reports employment of industries at the 3-digit Standard Industrial Classification (SIC) level. The industry selection procedure consisted of four separate steps.

First, industries with large employment size were selected because we wanted sectors that were major contributors to Wisconsin's employment base. This group includes 3-digit SIC industries with average

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[1/] The inconsistencies in the responses to this question suggest that employers did not understand the question the way it was intended. Consequently, the responses to the question were not used in the report.

employment level for 1984-86 greater than all 3-digit SIC industries' average employment plus one standard deviation, or 14,208 employees.

Second, industries with high employment growth rate were included because these represent sectors most likely to experience difficulty finding qualified workers. This group includes all 3-digit SIC industries with employment growth of 20 percent or more between 1984 and 1986.

Third, industries with large average firm-size were also selected. This group includes 3-digit SIC industries with average firm-size greater than the average firm-size of all manufacturing and service industries plus one standard deviation or 185 employees. These larger firms were also more likely to have formal training programs.

These steps yielded a preliminary 3-digit SIC list consisting of 109 industries as follows: 27 3-digit industries that qualified under the sector employment size criterion; 54 3-digit industries that qualified under the employment growth criterion; and 28 3-digit SIC industries that qualified under the firm-size criterion.

From the preliminary list, 16 industries were selected based on four combinations of the three characteristics described above. (See Table 1).

insert Table 1 here

After selecting the target industries the next stage was to select the occupations of particular concern within the 16 sectors.

B. Stage II - Selection of Core Occupations

In selecting the occupations three preliminary lists were drawn based on occupational employment levels in 1985 and the projections to 1995. The following steps were used to select core occupations to be included in the survey.

First, only those occupations in the 16 selected industries with 1985 employment greater than one standard deviation above the average for all the occupations in the selected industries were chosen. This criterion selected larger occupations. As a result five occupations with 1985 employment above 5318 were included.

TABLE 1

Preliminary Industry List

SIC Code	Description
Sectors with large employment size and large growth rate	
739	Miscellaneous business services
736	Person supply services
Sectors with large employment growth rate and large firm size	
357	Office computer & accounting machine
373	Ship and boat building
381	Engineering, lab. scientific and research instruments
632	Accident and health insurance medical plans
348	Ordinance and accessories ex. vehicles and guided missiles
Sectors with large employment size and large firm size	
806	Hospitals
531	Department stores
805	Nursing and personal care
262	Paper mills exc. building paper
351	Engines and turbines
362	Electrical Industry Apparatus
High technology industries with high projected employment growth	
355	Special industry machines
361	Electric distributing equipment
366	Communication equipment

Second, occupations in the 16 selected industries with expected employment growth between 1985 and 1995 greater than one standard deviation above the average employment growth rate for all occupations were listed. This criterion selected occupation with increased prospects of supply shortfalls. Sixteen occupations with 1985-95 employment growth rate above 26 percent were included in this list.

Third, the occupations selected above were combined and edited to exclude managerial occupations, since the focus of the study is on non-managerial occupations, and occupations that require only short demonstrations and which by their nature cannot experience skill imbalance (See Appendix II). For example, financial managers and "all other helpers, laborer, mover" were excluded. Table 2 lists the 11 core occupations selected.

insert Table 2 here

These 11 occupations are the core occupations within the 16 industries around which the remaining occupations included in the questionnaire for each industry revolve. The remaining occupations included in the survey are those with asterisks in Appendix II. Those occupations were included because of their contribution to employment in the industry, the employment outlook, and whether they require training besides short demonstration. Table 3 displays the average proportion of the firm's total employment represented by the occupations selected.

insert Table 3 here

Note that the original list from which these 11 non-managerial occupations were selected because of their large employment base and high growth came from 16 industries. However, the 11 occupations may not necessarily be found in all the 16 industries which were also selected because of large industry employment base, high growth, and large average firm size. In order to combine industry employment trend with occupational employment trend, a final step identified the industries that employ the selected occupations.

TABLE 2

List of Core Occupations

OES CODE	Occupational Title	Average Employment 1985	Projected Employment (1985)	Projected Employment Growth 1985-95
32502160	Reigistered Nurse	20,280	27,640	36%
32505198	Licensed Practical Nurse	10,400	11,750	13%
25102076	Computer Systems Analysts, EDP	540	790	46%
22126055	Electrical Electronic Engineer	1,040	1,390	34%
66008401	Nursing Aides and Orderlies	25,060	28,790	15%
22505213	Electrical, Electronic Technicians	1,040	1,370	32%
56011295	Computer Operations, Exc. Periph.	300	390	30%
53302280	Insurance Adjusters, Investigators	1,280	1,530	20%
25105232	Computer Programmers	1,280	1,580	23%
25108231	Computer Programmer Aides	180	230	28%
21508033	Employment Interviewers	2,110	2,320	10%

* All is the percentage of employers with difficulty in hiring. Rural and urban are percentages of rural and urban employers with difficulty in hiring.

TABLE 3

Significance of Selected Occupations to Sector's Workforce

SIC	Description	Percent Total Workforce
357	Office, Computer & Accounting Equipment Mfg.	31.0%
361	Electrical Distributing Equipment Mfg.	31.8%
362	Electrical Industrial Apparatus Mfg.	30.4%
366	Communications Equipment Mfg.	15.4%
381	Engineering, Laboratory Research Instruments Mfg.	56.5%
632	Accident and Health Insurance Plans	51.0%
736	Personnel Supply Services	47.0%
737	Computer Programming, Data Processing & Other Computer Related Services	62.7%
805	Nursing and Personal Care Facilities	65.2%
806	Hospitals	50.5%

Source: Appendix II.

C. Stage III- Final Industry Identification

Based on the 16 industries selected in stage I and the occupations selected in stage II, an industry-occupation matrix was drawn (Appendix III). Industries that employ any of the 11 selected occupations constituted the industry sample for the study. Ten 3-digit SIC industries qualifying under this step were sampled (Table 4).

insert Table 4 here

D. Stage IV - Selection of Firms

The next task was to select the firms for the survey. A total of 501 firms were sampled from 1,464 firms in the 10 3-digit SIC industries (representing about 30 percent of all firms in the selected industries). The number of firms selected from each industry was proportional to the industry's share of total employment in the 10 industries.

First, firms in each industry were stratified by region and within each region by firm size. The state was divided into 9 regions based on the Wisconsin Department of Development, Bureau of Research's regional breakdown (see map in Appendix IV). The number of firms selected from each region was proportional to each region's contribution to employment in the industry concerned. Within each of the nine regions firms were further grouped under three categories by employment size: large, medium and small. The number of firms selected in each category was based on each category's contribution to employment in the region for the particular industry. Finally, firms in the categories were picked at random by assigning random numbers and selecting each nth number(where n= the number of firms in each category divided by the number of firms to be selected from each category).

E. Response Rate

Out of the 501 questionnaires sent, 260 firms responded (52 percent of the firms surveyed). A detailed list of the firms sampled and responding from 51 counties is presented in Table 5.

TABLE 4

Selected SICS

SIC Code	Industry Group	Average No. of Units 1984-1986	Average Firm Size	Average Employment 1984-1986	Employment Growth 1984-1986
357	Office Computer & Accounting Equipment	23	126	2,867	64%
361	Electrical Distributing Equipment	40	185	5,980	-4%
362	Electrical Industrial Apparatus	93	185	17,144	-10%
366	Communication Equipment	30	117	3,485	-1%
381	Engineering, Lab. Research Inst.	15	166	2,489	54%
632	Accident & Health Insurance Plans	33	189	6,292	31%
736	Personnel Supply Service	275	60	16,348	35%
737	Computer Programming, Data Processing & Other Computer Related Services	478	13	6,422	12%
805	Nursing & Personal Care	330	112	36,963	5%
806	Hospitals	147	461	67,708	-4%
	Total	1,464		165,698	

* Percent of total, rural, or urban employers that believe that current employees need training.

TABLE 5

Response Rate

SIC	No. of Question-naires Mailed	No. of Responses	Usable Responses	Response Rate	Usable Response	No. of Counties
357	12	4	3	33%	25%	7
361	12	9	9	75%	75%	4
362	33	14	10	42%	30%	12
366	19	11	9	57%	47%	10
381	14	7	5	50%	36%	8
632	12	5	5	41%	41%	5
736	87	40	32	44%	37%	18
737	128	59	54	45%	42%	24
805	110	66	59	60%	54%	37
806	74	45	35	60%	47%	30
Total	501	260	221	52%	44%	51

* Proportion of all firms or firms of this size believing that current employees need training.

III. SUMMARY

In this chapter, the questionnaire used for the study has been described and the conceptual basis of the questions reviewed. The sampling procedure was also outlined. In the next chapter we present a framework for the analysis of the information gathered, and define some of the variables used in the analysis.

CHAPTER 3

ANALYTICAL FRAMEWORK

The goal of this study is to identify the training needs of occupations critical to Wisconsin employers. The fundamental question is to determine possible gaps in preparation and whether such gaps are prevalent for larger or smaller firms located in rural or urban areas. Furthermore, since technological change is a significant source of change in job requirements, that source of occupational change is examined explicitly. The following pages present an outline of the analysis of the survey and a brief definition of the variables used in the analysis.

I. OUTLINE OF THE ANALYSIS

First, responses to recent and expected changes in number of workers in selected occupations provides some indication of the magnitude of the occupational change occurring. Second, a summary of employer's responses to a series of questions about hiring difficulties and strategies used to resolve them gives some insight about the availability of qualified people in the labor market. To learn more about the preparation of workers, questions were posed about the preparation of existing and newly hired workers and how employers were training their workers. Finally, training needs due solely to technological change are analyzed. Since all responses are sector-specific the analysis is reported by sectors.

Changes in available positions between 1987 and 1988 as well as the expected changes for 1989 are presented in Table 1.*** [2/] (the three asterisks represent the 3-digit SIC number for the specific industry analyzed). Table 1.*** summarizes employers' responses to survey questions 3 and 4 of the survey.[3/] These changes in the occupational distribution of workers indicate the new mix of labor resources needed by employers.

[2/] Expected change for 1989 is the average across all firms responding to that question. If the average was less than 2, a decline is indicated. If the average was 2, no change was indicated. If the average was greater than 2, then an increase was indicated.

[3/] A copy of the questionnaire is found in Appendix I.

Table 2.*** summarizes the difficulty encountered by employers in hiring qualified people to fill available positions. The table reports the responses to survey question 7. It assesses whether there are enough people in the labor force with the requisite training needed to do the available jobs. Table 2.*** also separates rural and urban responses to determine whether differences exist in the supply of qualified people.

Joint consideration of Tables 1.*** and 2.*** gives insight into the likely difficulty filling some occupations. Examination of the labor skills demanded that are difficult to meet constitute the basis for identifying needed training slots.

Table 3.*** summarizes the responses to question 8 about how employers resolved the difficulty in hiring qualified people. In essence, it provides the employers' responses in the failure of the market to supply the qualified personnel needed.

Tables 4.*** and 5.*** identify training needs of current employees, as viewed by employers, the needs are specific to firms due to sector, location, and size. Table 4.*** summarizes responses to question 13 of the survey by location of firm, while Table 5.*** summarizes the responses to question 13 by size of firm.

Employers' training preferences are summarized in Table 6.***. This table presents responses to question 15. It gives an indication of the types of training employers believe is most effective in developing or maintaining the overall knowledge and skills of employees.

Table 7.*** gives an idea about the occupational preparation of newly hired employees (question 6 of the survey). The table displays the extent to which the training of newly hired employees match the skill requirements of the jobs they take. For instance, if the occupational preparation of new hires is low in relation to the expectations of employers, that suggests the need to improve the training effort for people aspiring to those occupations.

Tables 8.*** through 12.*** assess training needs due to technology adoption and the types of firms (by size and location) that are more likely to introduce new technology. Tables 8.*** and 9.*** summarize responses from question 9 (adoption of specific types of technology) of the survey relative to the employment size and location of the firm.

Table 10.*** reports employers' responses to part of question 11 which seeks to find out whether or not the adoption of technology affects the basic skills required in individual occupations. The impact of technology on basic skills is needed to assess whether employees' current levels of basic mathematics, science, reading, and writing skills are sufficient to cope with technological changes. Table 11.*** gives insight into the effect of technology adoption on technical and job-related skills needed (the other part of question 11). The extent to which training and retraining is needed, in given occupations, due to the adoption of technology, is depicted in Table 12.*** which shows responses to question 12.

Table 13 provides a summary of the responses to questions 16, 17, and 18 across all the sectors contacted. The table gives insight into the extent to which the firm's own formal in-house training is used. It also gives an indication of how satisfactory these programs are and the extent to which firms are interested in programs organized by outside trainers. Finally, Table 14 presents a summary of responses to question 5, also, across all sectors. It highlights the extent of cooperation between employers and training institutions in the recruitment of new hires.

II. DEFINITION OF VARIABLES

The following paragraphs presents definitions of some of the concepts, words, and phrases used in the report.

Firm size is used throughout the study to mean the total number of workers employed by a firm in a specific location. For instance, if a firm is a branch of a multiunit or multi-location firm, size reflects only the total number of workers in the location which was surveyed and excludes workers in other locations.

The location of a firm is either rural or urban. By rural we refer to non-metropolitan counties while urban refers to metropolitan counties. (See Appendix IV).

Occupations within firms are defined as either technology-oriented or less technology-oriented (see Appendix II). Technology oriented occupations in this study refer to occupations that require in-depth knowledge of the concepts and principles underlying the firm's technical operations. By this definition technology-oriented occupations may include, but are not restricted to, high-tech occupations as defined by the Bureau of Labor Statistics (BLS) [see Riche, Hecker and Burgen, 1983 for BLS definition]. For instance, in the hospital industry registered nurses are classified as a technology-oriented occupation, but is not a high-tech occupation by the BLS definition.

Throughout the study five types of employee training methods are mentioned:

1. Formal in-house training by firm's own trainers.
2. Formal in-house training by outsiders (customized training).
3. Formal outside training by equipment manufacturer/supplier.
4. Formal outside training by other organizations.
5. On-the-job training.

Formal in-house training by firm's own trainers refers to class-room type training by trainers on the payroll of the firm whose workers are being trained. These trainers primary duty could be to train workers or they could also have other responsibilities in addition to training (e.g., a supervisor who also does formal training of workers).

Formal in-house training by outsiders refers to classroom type of training by an outside organization in facilities provided by the company. The training, however, is tailored to the specific needs of the company. This is referred to in the literature as customized training.

Formal outside training by manufacturers or suppliers of equipment refers to classroom type of training organized by equipment manufacturer or supplier. This type of training generally is specific to the equipment or technology.

Formal outside training by another organization refers to classroom type training organized by a training institution like a vocational-technical college or University Extension or private training firm.

On-the-job training refers to training acquired by the employee through his/her routine tasks. This excludes formal training through other work study programs which may be included in any of the above formal training types.

Basic skills are defined in the study to include basic mathematics, science, reading, and writing. Technical skills refer to a more complex mental, manipulative, and interpersonal skills associated with a particular job.

III. SUMMARY

This chapter gives a framework for analyzing the survey and it defines the key concepts used. In the following chapters we report the data, and interpret the results.

Chapters 4 through 8 discuss the Services and Finance Insurance and Real Estate (FIRE) sectors. Chapters 9 through 13 discuss the manufacturing sector. Finally, Chapter 14 discusses the extent of employers' own formal in-house training and the recruitment method used by employers. This chapter's analysis is across all the 10 sectors studied.

CHAPTER 4

HOSPITAL INDUSTRY - SIC 806

This sector includes establishments primarily engaged in providing diagnostic services, extensive medical treatment including surgical services, and other hospital services as well as continuous nursing services. The sector excludes convalescent homes or hospitals for which data and results are presented under SIC 805.

The medical services industry is relatively important to Wisconsin economy. The 155,000 jobs in 1986 made the medical services the largest service sub-group. The second largest services sub-group was business services which provided 70,000 jobs in 1986. Even though the Wisconsin medical services employment increased at only two-thirds of the national average over 1986, it still employed relatively more of Wisconsin's workers than the national average [DILHR, 1987].

Employment Growth and Difficulty in Hiring Qualified Personnel

The distribution of employment in major non-managerial occupations for 1987 and 1988 and the expected change in 1989 employment for 35 hospitals in Wisconsin is presented in Table 1.806. While employment increased in all occupations between 1987 and 1988 most of the new jobs were in registered nursing which accounted for over 57 percent of all new positions. The expected changes in employment for 1989 also suggest continued employment growth for registered nurses, nurses aides and office clerks.

insert Table 1.806 here

The occupational positions which employers find it difficult to fill are presented in Table 2.806. The most severe problem is in hiring registered nurses, where 89 percent (31 out of 35) of employers reported difficulty. According to Table 1.806, this is also the occupation with the highest employment growth. The occupation with the next greatest difficulty in hiring is medical/clinical laboratory technologists with half of

TABLE 1.806

Hospital Industry - SIC 806

Employment Growth By Occupation

(n = 35)

Occupation	Employment 1987	Employment 1988	Employment Changes 1987-1988 #	Employment Changes 1987-1988 %	Expected Change 1989*
Registered Nurses	2033	3088	1055	51.9%	+
Nurses Aides/Orderlie	1023	1300	277	27.1%	+
Licensed Practical Nurses	459	569	110	24.0%	-
Medical/Clinical Technologists	246	319	73	29.7%	0
Food Preparation Workers	465	629	164	35.3%	-
Office Clerks	506	582	76	15.0%	+
Secretaries	221	311	90	40.7%	0
Total	4953	6798	1845	37.3%	

* + means expected increase in employment.
0 means no change in employment is expected.
- means expected decrease in employment.

the employers reporting difficulties. In the remaining occupations less than 35 percent of the employers reported difficulties in hiring qualified workers.

Employers in the urban areas face slightly more difficulty in hiring than employers in the rural areas in all occupations except for medical laboratory technologists. For medical clinical laboratory technologists the difficulty is almost equally shared by both rural and urban employers. The general difficulty of urban employers in hiring qualified workers may reflect the varied opportunities of workers in urban settings.

insert Table 2.806 here

The difficulties in hiring registered nurses may be due to their long period of training as well as the relatively low wages and strenuous working conditions. For instance, in 1983 over a third of registered nurses who completed their programs in the U.S had 4-year bachelor's degrees or higher [U.S. Department of Labor, 1986]. Low wages and severe working conditions and competition from outside the hospital industry for registered nurses also have the tendency of creating artificial shortages. Evidence of the effect of low wages and competition on the supply of registered nurses is suggested in Table 3.806 which indicate that most hospitals used wage increase to overcome the difficulty in hiring registered nurses. The next strategy used is overtime. One third or less of the respondents increased training or altered the job to overcome the hiring difficulty.

Medical/clinical laboratory technologist jobs were the second most difficult occupation to fill. Table 1.806 indicated there were few new jobs in this field in 1988. However, in Table 2.806 medical/clinical laboratory technologists were the second most difficult to hire. In Table 3.806 it was also the occupation, in addition to registered nurses, in which most employers used overtime and wage increases as means to overcome hiring difficulties. The use of overtime and wage increases suggests there may be a shortage of Wisconsin medical/clinical laboratory technologists.

insert Table 3.806

TABLE 2.806

Hospital Industry - SIC 806

Employers Difficulty in Hiring Qualified People

Occupation	% of Employers with Difficulty* All	% Rural	% Urban
Registered Nurses	88.6%	83.3%	94.1%
Nurses Aides	31.4%	27.8%	35.3%
Licensed Practical Nurses	34.3%	33.3%	35.3%
Medical/Clinical Laboratory Technologist	48.6%	50.0%	47.1%
Food Preparation Workers	22.9%	16.7%	29.4%
General Office Clerk	14.3%	11.1%	17.6%
All Secretaries	20.0%	11.1%	29.4%
Total No. of Employers	35	18	17

* All is the percentage of employers with difficulty in hiring. Rural and urban are percentages of rural and urban employers with difficulty in hiring.

TABLE 3.806

Hospital Industry - SIC 806

Employers Response to Difficulty in Hiring Qualified People

(n - 35)

	Percent of Employers Using*								
Occupation	Promotion	Overtime	Job Redesign	Transfer	Expand Training	Raise Wages	Delay Expansion	Other	No Problem
Registered Nurses	37.1%	57.1%	31.4%	34.3%	34.3%	82.9%	5.7%	11.4%	8.5%
Nurses Aides	8.6	20.0	11.4	8.6	22.9	11.4	2.9	0.0%	51.4%
Licensed Practical Nurses	5.7	25.7	8.6	5.7	8.6	17.1	0.0	2.9%	51.5%
Medical/Clinical Technologist	17.1	28.6	8.6	8.6	11.4	31.4	2.9	0.0%	28.5%
Food Preparation Workers	5.7	5.7	5.7	5.7	11.4	2.9	0.0	0.0%	71.4%
General Office Clerk	22.9	5.7	8.6	14.3	8.6	0.0	0.0	2.9%	68.5%
All Secretaries	22.9	5.7	0.0	11.4	11.4	2.9	2.9	2.9%	42.5%

* Multiple responses permitted.

Overall Training Needs for Existing Employees

The employers' response about the need for training current employees are given in Table 4.806. Registered nurses were again considered by most employers (83 percent) as needing training updates. Medical/clinical laboratory technologists and licensed practical nurses also featured prominently (69 percent and 63 percent respectively) as needing training updates. These three occupations require extensive knowledge about the operations of hospitals and are considered technology-oriented occupations.

Food preparation workers, office clerks and secretaries were less frequently (< 50 percent) mentioned as needing added training. Jobs of these less frequently mentioned occupations do not require extensive knowledge about hospital technologies and are also considered as less technology-oriented occupations.

The expressed greater need for training in technology-oriented occupations than the less technology-oriented occupations is open to speculation. First, the differences may reflect the importance that employers attach to the occupations rather than a concern about the low preparation of the workers. For instance, food preparation workers, as we see later in Table 7.806, are the least prepared workers. Yet, it is also the occupation least frequently mentioned as needing training. Second, the differences in training need may reflect the restructuring in the hospital industry. For example, even though registered nurses are among the best prepared workers (Table 7.806) most employers believed they needed additional training. Pressure to lower medical cost by freezing medicare hospital payments and physician fees has led to registered nurses assuming duties previously performed by other health personnel [Silvestri and Lukasiewicz, 1988]. These new responsibilities require extra training for registered nurses.

The distribution of responses among rural and urban employers indicated a striking pattern. While a larger percentage of employers in the rural areas believed that training is needed for technology-oriented occupations, a larger percentage of employers in the urban centers believed that less technology-oriented occupations needed training. For instance, over 67 percent of rural hospitals believed that registered nurses, medical/clinical laboratory technologists, and licensed practical nurses needed training, while over 47 percent of urban hospitals believed that nurses aides, office clerks, and secretaries needed training.

insert Table 4.806 here

TABLE 4.806

Hospital Industry - SIC 806

Employers Beliefs That Current Employees Need Training by Location

Occupation	Total	Rural*	Urban*
Registered Nurses	82.9%	94.4%	70.6%
Nurses Aides	48.6%	38.9%	58.8%
Licensed Practical Nurses	62.9%	66.7%	52.9%
Medical/Clinical Technologist	68.6%	83.3%	52.9%
Food Preparation Workers	14.3%	16.7%	11.8%
General Office Clerk	34.3%	22.2%	47.1%
All Secretaries	42.9%	22.2%	64.7%
Total No. of Employers	35	18	17

* Percent of total, rural, or urban employers that believe that current employees need training.

In Table 5.806 the percent of employers that believe current employees need training show some interesting patterns. Secretaries and office clerks are most frequently cited by larger hospitals as needing training while the largest share of smaller hospitals believe that medical/clinical laboratory technologists have the greatest training needs. The higher training needs for secretaries and clerical staff in the larger hospitals may reflect greater volume of administrative work. The greater need for training of medical/clinical technologists in smaller hospitals may reflect that smaller hospitals do not have medical/clinical technologists as qualified as those in the larger hospitals to start with, so they have to be trained more often than those in the larger hospitals. It could also mean that because of relatively less specialization in smaller hospitals medical technologists have to do more varied jobs than those in larger hospitals and this requires more training. The training needs for registered nurses and licensed practical nurses have no discernible relationship with the size of the hospital. This may reflect that the difficulty in hiring qualified people to fill positions of nurses require hospitals to consider their training as important irrespective of the size of the hospital.

insert Table 5.806 here

Employers Training Methods Preferences

Table 6.806 presents responses to the type of training that employers think is most effective for developing and maintaining overall knowledge and skills of employees. On-the-job training is the obvious preference of most employers. Across all the occupations, over 65 percent of the hospitals think that on-the-job training is the most effective training method. Hospitals' second preference is formal in-house training. In all occupations, except medical/clinical laboratory technologists, about half of the respondents think some type of formal in-house training is effective for maintaining overall knowledge and skills of workers. Formal outside training is generally the least preferred by employers.

insert Table 6.806 here

TABLE 5.806

Hospital Industry - SIC 806

Employers Beliefs That Current Employees Need Training by Firm Size

Occupation	All Employers*	Firm Employment Size* < 200	201-500	501-1000	>1000
Registered Nurses	82.9	70.0%	100.0%	57.1%	90.0%
Nurses Aides	48.6%	50.0%	25.0%	71.4%	50.0%
Licensed Practical Nurses	62.9%	70.0%	62.5%	71.4%	60.0%
Medical/Clinical Technologist	68.6%	90.0%	87.5%	42.8%	40.0%
Food Preparation Workers	14.3%	10.0%	37.5%	14.3%	10.0%
General Office Clerk	34.3%	10.0%	50.0%	28.6%	50.0%
All Secretaries	42.9%	10.0%	50.0%	42.9%	60.0%
Number of Firms in Size Category	35	10	8	7	10

* Proportion of all firms or firms of this size believing that current employees need training.

TABLE 6.806

Hospital Industry - SIC 806

Employers Training Preferences*

(n - 35)

Occupation	Formal In-House Training		Formal Outside Training		On-the-Job Training
	Own	Customized	Supplier	Other	
Registered Nurses	82.9%	77.1%	57.1%	57.1%	74.3%
Nurses Aides	62.9%	25.7%	17.1%	20.0%	74.3%
Licensed Practical Nurses	68.6%	28.6%	34.3%	31.4%	74.3%
Medical/Clinical Technologist	40.0%	34.3%	54.3%	48.6%	65.7%
Food Preparation Workers	48.6%	8.6%	14.3%	17.1%	82.9%
General Office Clerk	48.6%	31.4%	25.7%	20.0%	80.0%
All Secretaries	60.0%	28.6%	28.6%	25.7%	80.0%

* Multiple responses permitted.

There are variations in the specific form of training preferred. For example columns 1 and 2 of Table 6.806 show that formal in-house training offered by the hospitals' own trainers is substantially preferred over formal in-house training offered by outsiders(i.e., customized training). Columns 3 and 4 also indicate that for most occupations employers have a slight preference for formal outside training offered by suppliers than that offered by other organizations, especially in the technology-oriented occupations of LPNs and medical/clinical technologists.

Preferences of training types across occupations also display some variations. Despite employers overall preference for formal in-house training over outside training, most employers prefer outside training for medical/clinical laboratory technologists. Over 48 percent of employers prefer formal outside training for medical/clinical laboratory technologists while less than 40 percent prefer in-house training. Most probably, because of the relatively small number of medical/clinical laboratory technologists per hospital (Table 1.806), in-house training is less feasible.

Furthermore, column 5 of Table 6.806 shows that medical/clinical laboratory technologists occupation is the least responsive to on-the-job training. Again, a possible explanation could be that skills are not easily transferable from one type of equipment to another. As a result, employers prefer training offered by the supplier of the equipment or technology, or by other outside organizations instead of on-the-job training.

Occupational Preparation of Newly Hired Employees

Medical/clinical laboratory technologists were most frequently given the highest occupational preparation rating; a fifth of the respondents gave them the maximum rating of "very well prepared" even though they did not receive the highest average rating (Table 7.806). Food preparation workers were the most frequently mentioned as poorly trained; about 13 percent of respondents gave the occupation the lowest rating.

Average rating for all occupations ranged between 2.1 and 2.8 on the 4-point scale. Registered nurses and secretaries received the highest average rating while food preparation workers received the lowest average rating.O The high ratings for registered nurses and medical/clinical laboratory technologists reflects their long training periods. This high rating for registered nurse and medical/clinical laboratory technologists' preparation is an interesting contrast to their need for more training found in Table 4.806. The low rating for food preparation workers reflects that most of them learn on the job (see Table 6.806).

insert Table 7.806 here

Adoption of Technology and Its Implication on Skills and Training

Table 8.806 indicates no real pattern in hospital size regarding the adoption of new technologies. The exception is that 60 percent of all firms in the sample adopting cobalt radiation therapy (CRT) for cancer treatment and 71 percent of those with nuclear magnetic resonance (NMR) are hospitals with more than 1000 employees. The high cost of the technology -- the equipment cost itself and the need to shield staff and the surrounding population -- makes it too expensive to be adopted by smaller hospitals.

insert Table 8.806 here

Table 9.806 indicates there is no evidence that the location of the hospital influences the decision to adopt any of the technologies except CRT.

insert Table 9.806 here

Table 10.806 shows that between 14 and 41 percent of employers surveyed think that the basic skills requirements of workers will increase due to the introduction of technology. Only about four percent believe that basic skill requirements would decline, and then in just clerical and secretarial positions. The absence of evidence of decline in basic skill requirements and the tendency towards an increase in basic skills suggests that even though technology adoption will not require a drastic increase in basic skill requirements there is still a need to upgrade the basic skill base. For instance, not only do employers need a worker who can use the calculator to do some mathematics, but also they will need one who understands the basic principles used in the application of the calculator.

TABLE 7.806

Hospital Industry - SIC 806

Occupational Prepartion of Employees

Occupation	No. of Employers Responding	Occupational Preparation Rating* % Responding with 1-point	4-points	Average Rating
Registered Nurses	33	0.0%	9.1%	2.8
Nurses Aides	32	3.1%	6.3%	2.6
Licensed Practical Nurses	26	0.0%	3.9%	2.2
Medical/Clinical Technologist	30	0.0%	20.0%	2.7
Food Preparation Workers	32	12.5%	3.1%	2.1
General Office Clerk	31	0.0%	0.0%	2.3
All Secretaries	33	0.0%	12.1%	2.8

* Rating is based on a 4-point scale.
4 - Very well prepared.
1 - Not well prepared.

TABLE 8.806

Hospital Industry - SIC 806

Firm Size and Adoption of Technology

Size of Firm	% of Firms Adopting Technology			
	C.R.T@	C.A.T@	U.S.T@	N.M.R@
< 200	20%	21.4%	27.8%	14.3%
201-500	0.0%	28.6%	38.9%	14.3%
501-1000	20%	14.3%	11.1%	0.0%
> 1000	60%	28.6%	27.8%	71.4%
Total	5*	14*	18*	7*

@ C.R.T is abreviated for Cobalt Radiation Therapy, U.S.T for Ultrasound technology, C.A.T for computerized axial tomography, N.M.R for Nuclear magnetic resonance.

* Total number of firms adopting technology.

TABLE 9.806

Hospital Industry - SIC 806

Firm Location and Adoption of Technology

Location	Firms Adopting Technology			
	C.R.T@	C.A.T@	U.S.T@	N.M.R@
Rural	40.0%	57.1%	55.6%	57.1%
Urban	60.0%	42.9%	44.4%	42.95
Total	5*	14*	18*	7*

@ C.R.T is abreviated for Cobalt Radiation Therapy, U.S.T for Ultrasound technology, C.A.T for computerized axial tomography, N.M.R for Nuclear magnetic resonance.

* Total number of firms adopting technology.

insert Table 10.806 here

Similarly, Table 11.806 shows that employers are more convinced that technology adoption increases technical skills required. Between 18 and 75 percent of employers surveyed reported an increase in technical skills in all occupations while only between 14 percent and 41 percent of respondents reported an increase in basic skills (see Table 9.806). A comparison of the range of responses indicates that technology adoption increases technical skills more than it increases basic skills in the hospital industry.

Table 11.806 also indicates that increases in technical skills due to the introduction of technologies is not confined to technology-oriented occupations but also affects less technology-oriented jobs. Technology introduction increases the technical content of technology-oriented jobs like registered nurses and medical/clinical laboratory technologists. At the same time, the technical content of jobs, not closely related to the technology being introduced, also increases. This is probably due to a spillover effect. To the extent that technology adoption affects the skill level of most occupations, the need for training due to the introduction of technology is not confined to technology-oriented occupations.

insert Table 11.806 here

Employers' responses to the importance of training in adapting employees to technological change is presented in Table 12.806. Again, registered nurses are clearly the most frequently cited occupation in which hospitals consider training as "very important". No respondent considered training of registered nurses as "not important" in adapting to technological change. Food preparation workers require the least training in adapting to technological change. Only five percent of respondents considered training and retraining important in adapting food preparation workers to technological change and 23 percent said training and retraining was not important. For all the other occupations, hospitals held similar opinions about the importance of training in adapting employees to technological change.

insert Table 12.806 here

TABLE 10.806

Hospital Industry - SIC 806

Adoption of Technology and Changes in Basic Skills

Occupation	No. of Employers Responding	% of Employers Reporting Changes in Basic Skills		
		Increase	No Change	Decrease
Registered Nurses	24	37.5%	62.5%	0.0%
Nurses Aides	22	40.9%	59.1%	0.0%
Licensed Practical Nurses	21	28.6%	71.4%	0.0%
Medical/Clinical Technologist	21	33.3%	66.7%	0.0%
Food Preparation Workers	22	13.6%	86.4%	0.0%
General Office Clerk	23	39.1%	56.5%	4.3%
All Secretaries	25	36.0%	60.05	4.0%

TABLE 11.806

Hospital Industry - SIC 806

Adoption of Technology and Changes in Technical Skills

Occupation	No. of Employers Responding	% of Employers Reporting Changes in Technical Skills		
		Increase	No Change	Decrease
Registered Nurses	24	75.0%	25.0%	0.0%
Nurses Aides	22	50.0%	50.0%	0.0%
Licensed Practical Nurses	21	61.9%	38.1%	0.0%
Medical/Clinical Technologist	21	52.4%	47.6%	0.0%
Food Preparation Workers	22	18.2%	81.8%	0.0%
General Office Clerk	23	65.2%	30.4%	0.0%
All Secretaries	26	69.2%	26.9%	3.8%

TABLE 12.806

Hospital Industry - SIC 806

The Importance of Training and Retraining in Adapting Employees to Technological Change

Occupation	Importance of Training* (4)	(3)	(2)	(1)	Average Importance
Registered Nurses	69.57%	26.09%	4.35%	0.00%	2.40
Nurses Aides	30.00	35.00	35.00	0.00	1.69
Licensed Practical Nurses	28.57	57.14	14.29	0.00	1.89
Medical/Clinical Technologist	30.00	50.00	20.00	0.00	1.77
Food Preparation Workers	4.55	18.18	54.55	22.73	1.29
General Office Clerk	26.09	43.48	26.09	4.35	1.91
All Secretaries	21.74	56.52	13.04	8.70	2.00

* Graded on a scale of 1 (not very important) to 4 (very important).

Summary

Major findings of the effect of structural change on employment and training in the hospital industry include the following:

1. Most of the new jobs in the recent past have been for registered nurses. Employment will continue to grow in the industry. There will continue to be difficulty in hiring registered nurses and medical/clinical laboratory technologists. This difficulty cannot be overcome easily by modest wage increases.
2. Overall there is a greater need for training for current employees in technology-oriented occupations than for less technology-oriented occupations even though the better preparation of new hires in technology-oriented occupations suggests that technology-oriented occupations already have better training.
3. Hospitals in rural areas need training for existing employees in technology-oriented occupations more than hospitals in the urban areas. Alternatively, urban hospitals need training for their employees in less technology-oriented occupations more than do rural hospitals do.
4. Employers in hospitals generally prefer on-the-job training to formal in-house training or to formal outside training. They also prefer formal in-house training to formal outside training. However, for occupations directly related to technology, formal outside training is preferred to formal in-house training.
5. Registered nurses and secretaries are the most well-prepared workers among the selected occupations. Food preparation workers are the least prepared.
6. Adoption of new technologies will tend to increase rather than decrease the basic and technical skills required by almost all employees in the hospitals and will require training and retraining of most workers in adapting to the change.

CHAPTER 5

Nursing and Personal Care Facilities - S.I.C. 805

This industry group includes establishments primarily engaged in providing in-patient nursing and health-related personal care. It excludes establishments that provide residential social and personal care for children, the aged etc., where medical care is not a major element.

Demand for nursing and personal health care facilities in the U.S. is growing. Rising hospital care cost and the increased numbers of elderly and infirm have helped to make nursing and personal care one of the fastest growing areas in the health care industry. Most of the nursing and personal health care patients are 65 years or older, an age group projected to increase from 28.4 million in 1984 to 32.4 million in 1990 [U.S. Department of Commerce, 1987]. In addition, other factors like availability of Medicare and Medicaid payments, the growing inclusion of home and personal care facilities in health insurance policies, and the tendency for hospitals to discharge patients earlier than previously have also contributed to the growing demand for nursing and personal health care.

In Wisconsin the rate of population growth of people 65 years of age and older between 1970 and 1985 was 30 percent compared with a 5.3 percent growth rate for people under 65 years old [DILHR, 1987]. This high rate of growth among older people has increased demand for workers in the nursing and personal health care industry. For instance, employment in the industry rose by 7.6 percent between 1982 and 1988 compared with 3.4 percent for total employment growth in the state.

Employment Growth and Difficulty in Hiring Qualified Personnel

Distribution of employment for selected occupations in the 59 firms responding is shown in Table 1.805. Employment increases for all occupations between 1987 and 1988 are expected to continue through 1989. The greatest employment rate increase between 1987 and 1988 is registered nursing. However, there are more new jobs for nurses aides than for all other occupations combined (63% of all new hires were nurses aides). The employment growth is in support staff rather than health professionals.

insert Table 1.805 here

TABLE 1.805

Nursing and Personal Care Facilities - SIC 805

Employment Growth By Occupation

(n - 59)

	Employment		Employment Change 1987-1988		Expected Change
	1987	1988	#	%	1989*
Nurses Aides/Orderlies	2445	2737	292	11.9%	+
Licensed Practical Nurses	459	511	52	11.3%	+
Registered Nurses	465	536	71	15.3%	+
Cooks	283	291	8	2.8%	+
Laundry, Drycleaning Operator	216	235	19	8.8%	+
All Secretaries	105	120	15	14.3%	+
Total	3973	4430	457	11.5%	

* + means expected increase in employment.
0 means no change in employment expected.
- means expected decrease in employment.

Table 2.805 indicates that employers had difficulty in hiring registered nurses, nurses aides, and licensed practical nurses in that order. Secretaries were the least difficult to hire. Difficulty in hiring is more pronounced in rural areas than urban centers for most occupations. For instance, columns 2 and 3 show that for all occupations except laundry, dry cleaning operators and secretaries, a greater proportion of employers in rural areas reported difficulty in hiring than did urban employers.

insert Table 2.805 here

The difficulty in hiring registered nurses (as noted also in the section on the hospital industry) may be due to the low wages and severe working conditions as well as the long training period. Possible reasons for the difficulty in hiring licensed practical nurses and nurses aides may also derive from low wages and severe working conditions. Support for low wages as the possible cause of the nursing shortage is indicated by Table 3.805. The strategy used by most employers in resolving the difficulty in hiring registered nurses, nurses aides, and licensed practical nurses is to increase wages. Besides raising wages, overtime was the next strategy used by most employers in resolving the difficulty in hiring registered nurses and licensed practical nurses, but only at about half the frequency of raising wages. This suggests a shortage of qualified personnel. To resolve difficulty in hiring nurses aides, most employers used wage increases followed by expanding their own training efforts. This finding may not confirm a shortage, but rather an attempt to train aides to do jobs that are specific to the facility since no prior work experience is usually required. The use of overtime by over 31 percent of the employers indicates severe working conditions for RNs, LPNs and Nurses Aides. For cooks and laundry, drycleaning machine operators, employers raised wages in response to difficulties in hiring personnel, but most felt there was no problem. About 16 percent of employers also expanded own training efforts for cooks. Most employers had no problem hiring secretaries.

insert Table 3.805 here

TABLE 2.805

Nursing and Personal Care Facilities - SIC 805

Employers Difficulty in Hiring Qualified People

Occupation	% of Employers with Difficulty* All	% Rural	% Urban
Nurses Aides/Orderlies	74.0%	92.9%	58.1%
Licensed Practical Nurses	67.8%	85.7%	51.6%
Registered Nurses	78.0%	85.7%	70.9%
Cooks	22.0%	25.0%	19.4%
Laundry, Drycleaning Operator	11.9%	3.6%	19.4%
All Secretaries	8.5%	7.1%	9.7%
Total No. of Employees	59	28	31

* All is the percentage of employers with difficulty in hiring. Rural and urban are percentages of rural and urban employers with difficulty in hiring.

TABLE 3.805

Nursing and Personal Care Facilities - SIC 805

Employers Responses to Difficulty in Hiring Qualified Personnel

(n = 59)

	Percent of Employers Using *								
Occupation	Promotion	Overtime	Job Redesign	Transfer	Expanded Training	Raise Wages	Delay Expansion	Other	No Problem
Registered Nurses	20.7%	31.0%	13.8%	3.4%	12.1%	70.7%	5.2%	15.5%	12.1%
Nurses Aides	17.2%	31.0%	13.8%	8.6%	43.1%	58.6%	1.7%	8.6%	10.3%
Licensed Practical Nurses	13.8%	31.0%	15.5%	5.2%	15.5%	70.7%	0.0%	5.2%	6.9%
Cooks	15.5%	6.9%	1.7%	5.2%	15.5%	20.7%	1.7%	3.4%	48.3%
Laundry, Drycleaning Operator	3.4%	1.7%	1.7%	5.2%	3.4%	8.6%	0.0%	5.2%	63.8%
All Secretaries	12.1%	0.0%	3.4%	5.2%	1.7%	8.6%	0.0%	1.7%	65.5%

* Multiple responses permitted.

Overall Training Needs For Existing Employees

As indicated in Table 4.805, nurses aides, was the occupation most frequently cited as needing training for current employees, possibly reflecting the pattern of training nurses aides on the job (see Table 6.805). Currently employed registered nurses and licensed practical nurses were also mentioned frequently as needing training. The occupation least frequently reported as needing training was laundry, drycleaning machine operator.

The distribution of training needs, for most of the occupations, across rural and urban employers shows that a larger proportion of urban employers compared with rural employers believe that current employees need training. Consequently, employers in rural areas are less likely to train current employees than employers in urban areas. If one assumes that more training is desirable to workers then it is not surprising that rural employers have greater difficulty in hiring qualified workers (see Table 2.805).

As discussed in the hospital industry section, the need for training registered nurses and licensed practical nurses may reflect the importance employers attach to the two occupations, their increased responsibilities, and the need to curtail costs rather than low preparation of current workers. The high training need for nurses aides may also reflect the importance of the occupation to nursing and personal care facilities. As shown in Table 1.805, over 60 percent of employees in the occupations surveyed in these facilities in 1987 and 1988 were nurses aides. In addition more than 63 percent of the new jobs in 1988, for the occupations survey, were for nurse's aides.

insert Table 4.805 here

The relationship between training needs and firm size is mixed. Need for training of all occupations does not exhibit any clear pattern with firm size.

insert Table 5.805 here

TABLE 4.805

Nursing and Personal Care Facilities - SIC 805

Employers Belief That Current Employees Need Training by Location

Occupation	Total*	% Rural*	% Urban*
Registered Nurses	61.0%	53.6%	67.7%
Nurses Aides	81.0%	71.4%	90.3%
Licensed Practical Nurses	62.7%	53.6%	71.0%
Cooks	27.1%	17.9%	35.5%
Laundry, Drycleaning Operator	13.5%	14.3%	12.9%
All Secretaries	42.3%	46.4%	38.7%
Total Number of Employees	59	28	31

* Percent of total, rural, or urban employers that believe that current employees need training.

TABLE 5.805

Nursing and Personal Care Facilities - SIC 805

Employers Beliefs That Current Employees Need Training by Firm Size

Occupation	All Employers*	Firm Employment Size* <50	51-100	101-200	≥200
Registered Nurses	66%	54.5%	50.0%	64.7%	53.8%
Nurses Aides	90%	63.6%	83.3%	82.3%	61.5%
Licensed Practical Nurses	69%	54.5%	50.0%	64.7%	53.8%
Cooks	29%	27.3%	27.8%	17.6%	23.1%
Laundry, Drycleaning Operator	15%	9.1%	11.1%	5.8%	23.1%
All Secretaries	47%	18.2%	38.9%	47.1%	38.5%
Number of Firms in Size Category	59	11	18	17	13

* Proportion of all firms or firms of this size believing that current employees need training.

Employers Training Method Preferences

Table 6.805 indicates that for registered nurses, nurses aides, and licensed practical nurses, employers prefer their own formal in-house training to all other forms of training. For cooks, secretaries, and laundry, drycleaning machine operators, the industry prefers on-the-job training followed by its formal in-house training. The training preferences of employers for registered nurses, and secretaries in this industry is similar to that in the hospital industry. However, while employers in the industry prefer own formal in-house training for LPNs and Nurses Aides, employers in the hospitals prefer on-the-job training.

insert Table 6.805 here

For all occupations, on-the-job training is preferred to customized formal in-house training. However, employers cited customized training for occupations like registered nurses, nurses aides, and licensed practical nurses more frequently than they did for cooks, laundry, drycleaning machine operators and secretaries. This suggests that nursing and personal care facilities are more likely to seek outside training resources for the technologically oriented occupations, than for the less skilled occupations.

Formal outside training is the least preferred training method, but this varies among occupations. Employers prefer other formal outside training for registered nurses, nurses aides, and licensed practical nurses to formal training organized by equipment suppliers. On the other hand, the preference is for supplier organized training for cooks, secretaries, and laundry, drycleaning machine operators. This reflects employers desire to have workers who handle equipment like laundry machines, word processors and pressure cookers to be trained directly by suppliers but more technical workers like registered nurses and licensed practical nurses to be trained in a broader setting by other outside trainers.

Occupational Preparation of Newly Hired Employees

Newly hired registered nurses (RNs) were most frequently given the highest occupational preparation rating. Over 42 percent of the employers rated them as "very well prepared". However, licensed practical nurses (LPNs) scored the highest average rating of 3.4 on a 4-point scale. Licensed practical nurses were also the second most frequently cited as " very well prepared ". Neither RNs or LPNs

TABLE 6.805

Nursing and Personal Care Facilities - SIC 805

Employers Training Preferences*

(n = 59)

	Formal In-house Training		Formal Outside Training		
Occupation	Own	Customized	Supplier	Other	On-the-Job Training
Registered Nurses	64.4%	40.7%	16.9%	47.5%	52.5%
Nurses Aides	78.0%	39.0%	8.5%	25.4%	71.2%
Licensed Practical Nurses	69.5%	39.0%	11.9%	40.7%	55.9%
Cooks	64.4%	16.9%	15.3%	10.2%	71.2%
Laundry, Dry-cleaning Operator	55.9%	13.6%	18.6%	16.9%	71.2%
All Secretaries	54.2%	22.0%	18.6%	16.9%	69.5%

* Multiple responses permitted.

were given a "not well prepared" rating. Laundry, drycleaning machine operators were most frequently mentioned as " not well prepared " and also received the lowest average rating. But this occupation is typically entry level and prior training is likely to be minimal (see on-the-job training in Table 6.805).

insert Table 7.805 here

Adoption of Technology and Its Implication on Skills and Training

Table 8.805 indicates that larger nursing and personal care facilities are more likely to introduce new technology. For instance, firms employing over 100 workers constituted 50 percent of employers surveyed, yet they represent more than 64 percent of firms that have introduced either computers or fax machines.

insert Table 8.805 here

Table 9.805 also shows that employers in rural and urban areas are equally likely to introduce computers. But employers in urban areas are more likely to introduce fax machines than those in the rural areas. A possible explanation is fax machines are of recent vintage and computers have been around for quite some time. Considering that technology diffusion is slow and more likely to start from the urban centers the differences in adoption between the urban and rural firms is not surprising.

insert Table 9.805 here

In all occupations, except laundry and drycleaning machine operators, some employers think that basic skills of employees will increase with the introduction of technology (Table 10.805). In three of the six occupations three percent of the employers believe that introduction of technology will decrease basic skill needs of employees. Most employers, however, believe that the introduction of technology has not changed employees' basic skill requirements. While the percentage of employers who think basic skill requirements have declined never exceeds four percent, over 24 percent of the employers indicated increases in basic skills required in four of the six occupations. This suggests that in general, basic skills have not declined with the

TABLE 7.805

Nursing and Personal Care Facilities - SIC 805

Occupational Preparation of New Hires

Occupation	No. of Employers Responding	Occupational Preparation Rating* % Responding with: 1-point	4-points	Average Rating
Registered Nurses	57	0.0%	42.1%	3.2
Nurses Aides	56	8.9%	10.7	2.7
Licensed Practical Nurses	56	0.0%	37.5%	3.4
Cooks	54	3.8%	13.2%	2.8
Laundry, Drycleaning Operator	50	10.2%	4.1%	2.5
All Secretaries	48	2.1%	19.1%	3.0

* Rating is based on a 4-point scale:
4 - very well prepared
1 - not well prepared

TABLE 8.805

Nursing and Personal Care Facilities - SIC 805

Firm Size and Adoption of Technology

Firm Employment Size	% of Firms Adopting Technology	
	Computers	Fax
1 - 50	16.0%	0.0%
51 - 100	20.0%	33.3%
101 - 200	36.0%	0.0%
> 200	28.0%	66.7%
Total	25*	3*

* Total number of firms adopting technology.

TABLE 9.805

Nursing and Personal Care Facilities - SIC 805

Firm Location and Adoption of Technology

	% of Firms Adopting Technology	
Location	Computers	Fax
Rural	46.4%	0.0%
Urban	53.6%	100.0%
Total	25*	3*

* Total number of firms adopting technology.

introduction of technology but a tendency exists for technology introduction to increase the basic skill requirement of employees.

insert Table 10.805 here

In most occupations a large proportion of employers think there will be no change in technical skill requirements (Table 11.805) and that any impact of technology on technical skills will be an upgrading. This suggests the need to augment the technical component of the training programs for most employees in the industry especially registered nurses, nurses aides, licensed practical nurses, and secretaries.

insert Table 11.805 here

Table 12.805 reports employers responses to the importance of training in adapting to technological change. Registered nurses and licensed practical nurses were the most frequently cited occupations followed closely by secretaries and nurses aides in which training is considered as "very important" in adapting employees to technical change. Cooks and laundry, dry cleaning operators required the least training in adapting to technical change.

The importance of training in adapting registered nurses and licensed practical nurses to technological change reflects the importance of the two occupations to the operations in the nursing and personal care industry. It also reflects the changing nature of the actual job content of RNs and LPNs.

insert Table 12.805 here

Summary

The main findings in the nursing and personal care industry are as follows:

1. Growth in employment between 1987 and 1988 is expected to continue in all occupations in 1989. Nurses' aides accounted for more new jobs in 1988 than all of the other selected occupations.

TABLE 10.805

Nursing and Personal Care Facilities - SIC 805

Adoption of Technology and Changes in Basic Skills

Occupation	No. of Employers Responding	% of Employers Reporting Changes in Basic Skills: Increase	No Change	Decrease
Registered Nurses	32	25.0%	75.0%	0.0%
Nurses Aides	32	25.0%	75.0%	0.0%
Licensed Practical Nurses	33	24.2%	72.6%	3.0%
Cooks	30	3.3%	93.3%	3.3%
Laundry, Drycleaning Operator	28	0.0%	100.0%	0.0%
All Secretaries	30	53.3%	46.7%	3.3%

TABLE 11.805

Nursing and Personal Care Facilities - SIC 805

Adoption of Technology and Changes in Technical Skills

Occupation	No. of Employers Responding	% of Employers Reporting Changes in Technical Skills: Increase	No Change	Decrease
Registered Nurses	31	35.5%	64.5%	0.0%
Nurses Aides	31	48.4%	51.6%	0.0%
Licensed Practical Nurses	33	24.2%	72.7%	2.9%
Cooks	31	16.1%	83.9%	0.0%
Laundry, Drycleaning Operator	28	14.3%	85.7%	0.0%
All Secretaries	30	66.7%	33.3%	0.0%

TABLE 12.805

Nursing and Personal Care Facilities - SIC 805

The Importance of Training in Adapting Employees to Technological Change

Occupation	Importance of Training* (4)	(3)	(2)	(1)	Average Importance
Registered Nurses	41.4%	31.0%	6.9%	17.2%	2.9
Nurses Aides	39.3%	14.3%	7.1%	35.7%	2.4
Licensed Practical Nurses	41.4%	27.6%	10.3%	17.2%	2.9
Cooks	7.4%	11.1%	14.8%	63.0%	1.6
Laundry, Drycleaning Operator	0.0%	14.8%	25.9%	55.6%	1.5
All Secretaries	40.6%	18.8%	15.7%	15.6%	2.7

* Importance graded on a scale of 1 (not very important) to 4 (very important).

2. Registered nurses were the most difficult to find, followed by nurses aides. Difficulty in finding qualified workers was more pronounced in the rural areas than in the urban areas.
3. Nurses aides were the most often cited as needing extra training.
4. Formal in-house training is preferred by employers in technology-oriented occupations like registered nurses, and licensed practical nurses, than less technology-oriented occupations like cooks and laundry, drycleaning machine operators.
5. Larger firms in the industry are more likely to introduce new technologies. Urban firms also seem more likely to introduce technologies with more current vintages than rural firms.
6. Basic and technical skill requirements are both upgraded with introduction of new technologies.

The conclusions are that nurses aides have assumed a central role in the tasks performed in this industry and require attention in terms of training. In addition, training in rural communities needs to be increased to alleviate the disproportionate share of difficulties in hiring by rural nursing and personal care facilities.

CHAPTER 6

PERSONNEL SUPPLY SERVICES - SIC 736

This sector consists of establishments engaged in providing employment services. It includes employment agencies and help supply services. Employment agencies assist employers in hiring qualified workers. The agencies also assist in the placement of those seeking employment. The personnel supply services are engaged in supplying temporary or continuing help on a contract or for fee basis to other businesses. Even though the workers are under the supervision of the businesses to whom they are furnished, they are on the payroll of the supplying establishment. Establishments in the temporary help industry usually specialize in four main markets: office, industrial, medical, or engineering and technical [Carey and Hazelbaker, 1986]. Those in the office market usually hire workers such as secretaries, typists, receptionists, computer operators, and general office clerks. Those in the industrial market hire workers like helpers, laborers, and material movers. The firms that specialize in the medical market hire mostly nurses. Finally those in the engineering and technical market hire engineers, designers, non-medical practitioners, drafters, etc. In addition to the workers hired and supplied to other businesses the temporary help firms have their own permanent staff like employment interviewers, clerical staff, and secretaries.

The personnel supply services sector is important to the Wisconsin economy. Firms in this sector added the largest number of jobs in the services sectors between 1982 and 1985 in the State [DILHR, 1987]. Employment in the sector rose from 7,844 in 1982 to 16,639 in 1985, a gain of 112 percent compared with the 16.8 percent gain for all services and miscellaneous industry. In the three year period of 1982 to 1985 the number of firms in the sector also increased by more than 100 percent. Employment growth in the personnel service industry occurred through both new firms and increases in firm size.

Employment Growth and Difficulty in Hiring Qualified Personnel

Table 1.736 shows the distribution of employment in selected occupations for 1987 and 1988 and the expected change in 1989 employment. Employment increased in most occupations in 1988. Most of the new jobs were for employment interviewers which accounted for almost all of the new positions. Employment is expected to grow in all the selected occupations in 1989 despite the slight 1988 decline for stock clerks, and bookkeeping and accounting clerks.

insert Table 1.736 here

Occupations that employers have difficulty hiring qualified workers are presented in Table 2.736. Employers had the greatest difficulty in hiring qualified secretaries (34 percent of respondents reported difficulty). Occupations in which employers reported the next greatest difficulty in employing qualified workers were bookkeeping and accounting clerks and typists with 22 percent of employers reporting difficulties in both occupations. Finding qualified stock clerks was no problem for any of the respondents. General office clerks, licensed practical nurses, and registered nurses were occupations in which 9 percent or less of the respondents reported difficulty in hiring qualified people.

A possible explanation for the difficulty in hiring secretaries may reflect high demand for temporary secretaries (Table 1.736).

The minimal difficulty with stock clerks and general office clerks reflects the similarity of the basic skills needed for the occupations across employers.

The relatively low difficulty in hiring registered nurses and licensed practical nurses in this industry compared to the hospital industry indicates the availability of nurses for temporary employment but a shortage for full time positions. It may also reflect that temporary services supply a relatively smaller share of the market for nurses, hence the overall shortages do not pose much of a problem. Nurses may want to limit work in order to care for children, attend school, or simply have more leisure time. In some cases, they work primarily to keep their skills up to date instead of for the income alone. Many full time nurses also moonlight to supplement their income. The flexibility provided by the temporary services and the relatively smaller share of the market they control accounts for the absence of hiring difficulties. This result, to some extent, suggests that flexibility in working time is a possible solution to the shortage of nurses since there seem to be many willing to work on a temporary or part time basis.

Table 2.736 also shows that employers in urban areas reported more difficulty in hiring qualified workers than did firms in rural areas. This difficulty in urban centers may reflect a greater demand for

TABLE 1.736

Personnel Services - SIC 736

Employment Growth By Occupation

(n = 32)

Occupation	Employment 1987	1988	Employment Change 1987-1988 #	%	Expected Change 1989*
Employment Interviewers	153	225	72	47.1%	+
Stock Clerks	3	2	-1	-33.3%	+
General Office Clerks	24	27	3	12.5%	+
Licensed Practical Nurses	1	1	0	0.0%	+
Registered Nurses	35	37	2	5.7%	+
Bookkeeping/Acctng. Clerks	29	24	-5	-17.2%	+
Typists	11	11	0	0.0%	+
All Secretaries	37	39	2	5.4%	+
Total	293	366	73	24.9%	

* + means expected increase in employment.
0 means no change in employment is expected.
- means expected decrease in employment.

temporary workers or more competition for the temporary worker in urban than in rural areas. It could also suggest a latent work force (e.g., lower labor force participation allows those passively involved in formal work to respond to demand) in rural communities which temporary firms can use.

insert Table 2.736 here

Table 3.736 indicates employers adjustment pattern to the difficulty in hiring qualified people. The most frequent response is no problem. Wage raises and expansion of training are the next two most cited adjustments used by employers to resolve difficulty in hiring. Wage increases are used mostly in resolving hiring difficulties with secretaries. Expansion of training is used mostly for employment interviewers. Increased wages to hire secretaries reflect the need to augment the pool of secretaries through additional incentives (wages). Training expansion for employment interviewers also indicates that even though firms in the industry often do not offer much training to employees they furnish to their customers (other businesses) they do train their own staff employees.

insert Table 3.736 here

Overall Training Needs For Existing Employees

Responses to the training needs of current employees are shown in Table 4.736. Employment interviewers are considered by most employers as needing added training and a similar proportion believed secretaries and bookkeeping/accounting clerks needed training. The need for training for employment interviewers reflects the importance of well trained interviewers to screen and recruit qualified workers needed by customers of personnel supply firms. Personnel supply firms usually strive to ensure that workers on their payrolls met special skill levels [Carey and Hazelbaker, p. 39]. Since the firms normally do not offer skill training to applicants, they provide skilled workers through the recruiting process [Carey and Hazelbaker, p. 39]. Consequently, well trained recruiters (employment interviewers) are needed.

Stock clerks were the least frequently mentioned as needing training. The low training need for stock clerks reflects their relatively low and general skills which do not require any specialized training.

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TABLE 2.736

Personnel Services - SIC 736

Employers Difficulty in Hiring Qualified People

Occupation	% of Employers With Difficulty* All*	% Rural	% Urban
Employment Interviewers	18.7%	0.0%	22.2%
Stock Clerks	0.0%	0.0%	0.0%
General Office Clerks	9.4%	0.0%	11.1%
Licensed Practical Nurses	3.1%	0.0%	3.7%
Registered Nurses	9.4%	0.0%	11.1%
Bookkeeping/Acctng. Clerks	21.9%	20.0%	22.2%
Typists	21.9%	20.0%	22.2%
All Secretaries	34.5%	20.0%	37.0%
Total No. of Employers	32	5	27

* All is the percentage of employers with difficulty in hiring. Rural and urban are percentages of rural and urban employers with difficulty in hiring.

TABLE 3.736

Personnel Services - SIC 736

Employers Responses to Difficulty in Hiring Qualified Personnel

(n = 32)

	Percent of Employers Using *								
Occupation	Promotion	Overtime	Job Redesign	Transfer	Expand Training	Raise Wages	Delay Expansion	Other	No Pro
Employment Interviewers	6.3%	9.4%	6.3%	6.3%	15.6%	9.4%	9.4%	9.4%	37.5
Stock Clerks	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	34.4
General Office Clerks	0.0%	3.1%	6.3%	3.1%	3.1%	3.1%	0.0%	0.0%	37.5
Licensed Practical Nurses	0.0%	3.1%	3.1%	0.0%	0.0%	6.3%	3.1%	0.0%	31.3
Registered Nurses	0.0%	3.1%	6.3%	0.0%	0.0%	9.4%	3.1%	3.1%	28.1
Bookkeeping/Acctng. Clerks	9.4%	0.0%	0.0%	9.4%	0.0%	6.3%	6.3%	0.0%	37.5
Typists	0.0%	0.0%	3.1%	3.1%	0.0%	9.4%	3.1%	0.0%	37.5
All Secretaries	6.3%	3.1%	6.3%	3.1%	12.5%	15.6%	3.1%	0.0%	34.4

* Multiple responses permitted.

For stock clerks, LPNs and RNs, rural firms did not believe any training was needed by current employees. This may reflect more the frequency with which rural employers hire workers in these occupations rather than availability of qualified workers. In all other occupations, except secretaries, rural employers reported greater need for training current employees than did urban employees.

insert Table 4.736 here

The need for training was expressed more frequently by the very large firms in most occupations. Firms with employment size over 150 indicated greater need for training compared with those employing fewer than 150. This may indicate that even though temporary firms do not generally offer training, the large ones are considering training to remain competitive.

insert Table 5.736 here

Employers Training Method Preferences

Responses to the type of training that employers think is most important in developing and maintaining overall knowledge and skills is shown in Table 6.736. It must be noted again that personnel services often do not offer training. The responses reported here may reflect personnel service firms' perception of their clients' preferences. Consequently, the views summarize their clients' individual views.

On-the-job training is the preference for most employers in the training of employment interviewers, followed by own formal in-house training. The explanation for the on-the-job training preference includes the need for interviewers to be conversant with the specific labor markets in which the personnel supply service firm operates. As mentioned earlier, a firm may specialize in any of the following markets: office, industrial, medical or engineering and technical. Consequently, interviewers learn more about a particular pool of skills on-the-job or through formal in-house training.

Responses to the question on training needs for employees (other than employment interviewers) may reflect the views of personnel supply firms' customers rather than their own experience. As noted earlier most of the other occupations work under the direct supervision of the firm's customers (other

TABLE 4.736

Personnel Services - SIC 736

Employers' Beliefs That Current Employees Need Training by Location

Occupation	Total*	Rural*	Urban*
Employment Interviewers	43.8%	60.0%	40.7%
Stock Clerks	3.1	0.0	3.7
General Office Clerks	18.8	20.0	18.5
Licensed Practical Nurses	6.2	0.0	7.4
Registered Nurses	6.2	0.0	7.4
Bookkeeping/Acctng. Clerks	40.6	80.0	33.3
Typists	18.8	40.0	14.8
All Secretaries	43.8	40.0	44.4
Total No. of Employers	32	5	27

* Percent of total, rural, or urban employers that believe that current employees need training.

TABLE 5.736

Personnel Services - SIC 736

Employers Belief That Current Employees Need Training by Firm Size

		Firm Employment Size*			
Occupation	All Employers*	<10	11-50	51-150	>150
Employment Interviewers	62.5%	75.0%	50.0%	0.0%	66.7%
Stock Clerks	18.8%	30.0%	0.0%	0.0%	0.0%
General Office Clerks	46.9%	60.0%	0.0%	0.0%	100.0%
Licensed Practical Nurses	18.8%	0.0%	16.6%	66.7%	100.0%
Registered Nurses	21.8%	0.0%	16.6%	66.7%	100.0%
Bookkeeping/Acctng. Clerks	53.1%	60.0%	0.0%	66.7%	100.0%
Typists	43.8%	60.0%	0.0%	0.0%	66.7%
All Secretaries	71.8%	75.0%	83.3%	0.0%	100.0%
Number of Employers in Size Category	32	20	6	3	3

* Proportion of all firms or firms of this size believing that current employees need training.

businesses). Moreover, personnel supply firms usually do not do any training of workers. Consequently, the training preferences responses reflect the firm's perception of what their customers think. Hence, interpretation of the responses warrants caution. For instance, on-the-job training refers to workers experience on jobs in customers workplaces. Similarly own in-house training refer to customers own in-house training.

On-the-job training followed by own in-house training is preferred by employers for bookkeeping and account clerks. This may also be due to the specificity of jobs performed by bookkeepers and account clerks. The preference for on-the-job training of general office clerks shows the minimal training needed to orient them to each customer's specific needs.

insert Table 6.736 here

Occupational Preparation of Newly Hired Employees

Table 7.736 presents responses to the question about the occupational preparation of recently employed workers. Registered nurses were the most frequently given the highest occupational preparation rating. All respondents rated them as "very well prepared." Stock clerks were the least frequently mentioned as "very well prepared." Average ratings ranged from 2.0 to 4.0 on a 4-point scale. The high ratings for registered nurses as mentioned in the section on hospitals reflects their training length. The reason for the low preparation of stock clerks is that most of them learn after they are hired. The generally high incidence of "very well prepared" suggests a pool of skilled workers these firms have been able to tap.

insert Table 7.736 here

Adoption of Technology and Its Implication on Skills and Training

Table 8.736 shows that larger firms are more likely to introduce computers, fax machines and word processors than smaller firms. For instance, firms with employment of less than 10 constitute 60 percent of respondents yet, only 44 percent of them have installed computers. On the other hand, firms with employment size between 11 and 50 constitute 20 percent of respondents, and 28 percent of the firms have

TABLE 6.736

Personnel Services - SIC 736

Employers Training Preferences*

(n = 32)

	Formal In-House Training		Formal Outside Training		
Occupation	Own	Customized	Supplier	Other	On-the-Job Training
Employment Interviewers	46.9%	15.6%	12.5%	18.8%	59.4%
Stock Clerks	0.0%	.0%	0.0%	3.1%	12.5%
General Office Clerks	12.5%	3.1%	0.0%	9.4%	34.4%
Licensed Practical Nurses	9.4%	3.1%	3.1%	6.3%	6.3%
Registered Nurses	9.4%	6.3%	3.1%	6.3%	6.3%
Bookkeeping/Acctng. Clerks	28.1%	18.8%	15.6%	12.5%	37.5%
Typists	9.3%	3.3%	3.2%	7.5%	30.2%
All Secretaries	11.2%	8.4%	9.5%	10.4%	18.5%

* Multiple responses permitted.

TABLE 7.736

Personnel Services · SIC 736

Occupational Preparation of New Hires

Occupation	No. of Employers Responding	Occupational Preparation Rating* % Responding with: 1-point	4-point	Average Rating
Employment Interviewers	18	5.5%	16.7%	2.8
Stock Clerks	2	0.0%	0.0%	2.0
General Office Clerks	11	0.0%	27.3%	3.0
Licensed Practical Nurses	3	0.0%	66.7%	3.7
Registered Nurses	4	0.0%	100.0%	4.0
Bookkeeping/Acctng. Clerks	12	0.0%	16.7%	3.1
Typists	12	0.0%	25.0%	3.2
All Secretaries	19	5.3%	36.8%	3.2

* Rating is based on a 4-point scale.
4 = Very well prepared.
1 = Not well prepared.

installed computers. A substantially greater proportion of larger firms (> 51 employees) had adopted the technology.

insert Table 8.736 here

Table 9.736 shows that for word processors and computers the distribution of ownership is the same as the distribution of responses across urban and rural communities. Fax machines are, however, concentrated in urban areas.

insert Table 9.736 here

Table 10.736 shows that, except for LPNs, between 29 and 100 percent of employers surveyed think that basic skills will increase with the introduction of new technology. Only six percent reported a decline in skill level and that was only for bookkeeping and accounting clerks. Most employers believe technology adoption will not change basic skill levels. This result suggests that even though technology adoption may not change basic skill requirements appreciably, there is the tendency for basic skill requirements to increase, hence the need for increased training in basic skills.

insert Table 10.736 here

Table 11.736 similarly indicates that the introduction of technology will increase the technical skills required by workers. At least 33 percent of employers think that technical skills will be upgraded with the introduction of new technologies. None believed technical skills would decline.

insert Table 11.736

Employers responses to the importance of training in adapting employees to technological change is reported in Table 12.736. Secretaries, followed by bookkeeping and accounts clerks were the most frequently

TABLE 8.736

Personnel Supply Services - SIC 736

Firm Size And Adoption of Technology

Firm Employment Size	% of Firms Adopting Technology		
	Computers	Fax	Word Processors
1-10	44%	30%	40%
11-50	28%	0	20%
51-150	17%	30%	20%
> 150	11%	40%	20%
Total	18*	10%	5%

* Total number of firms adopting technology.

TABLE 9.736

Personnel Supply Services - SIC 736

Firm Location And Adoption Of Technology

Location of Firm	% of Firms Adopting Technology		
	Computers	Fax	Word Processors
Rural	17%	0%	20%
Urban	83%	100%	80%
Total	18*	10*	5*

* Total number of firms adopting technology.

TABLE 10.736

Personnel Supply Services - SIC 736

Adoption Of Technology And Changes In Basic Skills

Occupation	No. of Employers Responding	% of Employers Reporting Changes in Basic Skills		
		Increase	No Change	Decrease
Employment Interviewers	20	30.0%	70.0%	0.0%
Stock Clerks	6	50.0%	50.0%	0.0%
General Office Clerks	14	78.6%	21.4%	0.0%
Licensed Practical Nurses	5	0.0%	100.0%	0.0%
Registered Nurses	6	100.0%	0.0%	0.0%
Bookkeeping/Acct. Clerks	17	35.3%	64.7%	5.9%
Typists	17	29.4%	70.6%	0.0%
All Secretaries	20	35.0%	65.0%	0.0%

TABLE 11.736

Personnel Supply Service - SIC 736

Adoption Of Technology And Changes In Technical Skills

Occupation	No. of Employers Responding	Employers Response Change in Basic Technical Skills		
		Increase	No Change	Decrease
Employment Interviewers	21	66.7%	33.3%	0.0%
Stock Clerks	7	57.1%	42.9%	0.0%
General Office Clerks	17	64.7%	35.3%	0.0%
Licensed Practical Nurses	6	66.7%	33.3%	0.0%
Registered Nurses	6	33.3%	66.7%	0.0%
Bookkeeping/Acct. Clerks	17	58.8%	41.2%	0.0%
Typists	17	64.7%	35.3%	0.0%
All Secretaries	20	75.0%	25.0%	0.0%

cited occupations in which training is considered as "very important." General office clerks require the least training in adapting to technological change.

insert Table 12.736 here

Summary

Main findings in the personnel supply services sector include the following:

1. Employment growth is expected in all occupations including stock clerks, and bookkeeping and accounts clerks which registered minor declines in 1988. Most new jobs in 1988 went to employment interviewers.
2. Training is needed for all occupations even though greater need is expressed for employment interviewers and secretaries.
3. Employers prefer on-the-job training for most occupations reflecting the tendency of personnel firms providing a "skilled" worker who learns firm specifics on the job. Formal in-house training also features prominently and it is the most preferred form of training for registered nurses and licensed practical nurses.
4. Newly hired registered nurses are the most prepared workers among the occupations considered. Stock clerks are the least prepared among the occupations considered.
5. Larger firms are more likely to introduce new technologies than smaller firms.
6. Introduction of technology is more likely to increase rather than decrease basic and technical skill requirements of all occupations.

The conclusion is that employers are more concerned with training of employment interviewers than other occupations. This is because their training is crucial in the selection of a qualified pool of workers. The delivery of a "qualified" worker to their client is critical in the operations of personnel supply firms.

TABLE 12.736

Personnel Supply Service - SIC 736

The Importance Of Training And Retraining In Adapting Employers To Technological Change

Occupation	Importance of Training *				Average Importance
	(4)	(3)	(2)	(1)	
Employment Interviewers	50.0%	25.0%	5.0%	20.0%	3.1
Stock Clerks	25.0%	0.0%	0.0%	75.0%	1.8
General Office Clerks	14.3%	42.9%	7.1%	35.7%	2.4
Licensed Practical Nurses	16.7%	33.3%	0.0%	50.0%	2.2
Registered Nurses	28.6%	14.3%	0.0%	57.1%	2.1
Bookkeeping/Acctng. Clerks	56.3%	18.8%	6.3%	18.8%	3.1
Typists	53.9%	30.8%	0.0%	15.4%	3.2
All Secretaries	71.4%	14.3%	4.8%	9.5%	3.5

* Importance graded on a scale of 1 (not very important) to 4 (very important).

CHAPTER 7

COMPUTER PROGRAMMING, DATA PROCESSING, AND OTHER COMPUTER RELATED SERVICES - SIC 737

This sector includes establishments engaged in computer programming, data processing, and other computer related services. Major products and services of this industry group include computer programming services, prepackaged software, computer integrated systems design, computer processing, and data preparation and processing services, information retrieval services, computer rental and leasing, and computer maintenance and repair. The industry group excludes the manufacture of computer main frame and other computer hardware which are considered under S.I.C 357.

The computer programming, data processing, and other computer related services industry is a major contributor to new high technology employment in the state. Employment in the sector is expected to grow by 20.6 percent between 1985 and 1995, the second highest projected growth rate among the high technology industries in Wisconsin [DILHR, 1987]. The new jobs provided in the industry by 1995 represent about 14 percent of all new jobs in the service industry.

Employment Growth and Difficulty in Hiring Qualified Personnel

Employment distribution for major non-managerial occupations in the 54 firms responding is presented in Table 1.737. Employment increased for all occupations between 1987 and 1988 except for computer system analysts which registered a small decline. About 47 percent of all new jobs in 1987-88 were in computer programming. The expected change in employment for 1989 suggests continued growth in employment for only computer programmers and computer system analysts (which declined slightly in 1988). There are no employment changes expected for the remaining occupations.

insert Table 1.737 here

Computer programmers, followed by computer system analysts, were occupations that 44 and 26 percent of the employers respectively had difficulty in hiring (see Table 2.737). Less than 13 percent of the employers reported difficulty in hiring in the other occupations.

TABLE 1.737

Computer Programming ETC - SIC 737

Employment Growth By Occupation

(n = 54)

Occupation	Employment 1987	Employment 1988	Employment Change 1987-1988 #	Employment Change 1987-1988 %	Expected Change 1989*
Data Entry Keyers	217	250	33	15.2	0
Computer Programmers	259	314	55	21.2	+
Computer System Analysts	209	202	-7	-3.3	+
Computer Operators	56	62	6	10.7	0
Electrical and Electronic Technicians	63	69	6	9.5	0
Computer Programmer Aides	13	14	1	7.7	0
Bookkeeping and Accounting Clerks	36	45	9	25.0	0
Secretaries	82	97	15	18.3	0
Total	935	1053	118	12.6	

* + means expected increase in employment for 1989.
0 means no change in employment is expected in 1989.
- means expected decline in employment in 1989.

Difficulty in hiring qualified people is also more prevalent among urban employers than rural employers even though the majority of respondents were from rural areas. For instance, 58 percent of employers in the urban areas reported difficulty in hiring computer programmers while only 33 percent of rural employers indicated such difficulty. This disproportionate hiring difficulty by urban employers suggests the need for increased training effort for these occupations in urban communities.

One possible explanation for the difficulty in hiring computer programmers and computer system analysts is the specificity of employers needs. For example, accounting or business management employers prefer computer programmers or computer system analysts with a business background. Similarly, employers in scientifically oriented organizations prefer those with background in the physical sciences, applied mathematics, or engineering. The hiring difficulty may arise because of these specific preferences. The difficulty may also be attributable to the rapid changes in computer technology coupled with the long period of training. For instance over 41 percent of computer programmers that completed training in 1981 in the U.S. had bachelors or higher degrees. Similarly, over 80 percent of computer system analysts that completed training in 1981 had bachelors or other degrees requiring at least four years of college [U.S. Department of Labor, 1986]. The hiring difficulty may also be associated with the demand for computer systems analysts and computer programmers. The pervasiveness of computer technology means analysts and programmers are needed in most sectors. For example, 80 percent of all computer analysts employed in 1984 were in sectors other than the computer programming, data processing and other computer related services sector [U.S. Department of Labor, 1986].

insert Table 2.737 here

The three most cited strategies used by employers to resolve the hiring difficulties in this sector include raising wages, expanding the firm's own training efforts, and delaying expansion (Table 3.737). Employers used the first two strategies most for resolving difficulty in hiring computer programmers and computer system analysts. Even though a wage increase is the strategy used most frequently by employers (22 percent) the percentage of employers using the strategy is too low to suggest that low wages are the cause of difficulty in hiring programmers and analysts. Wage increase may be more a response to competition from other employers. Delaying expansion and expanding the firm's own training were two other strategies used by

TABLE 2.737

Computer Programming ETC - SIC 737

Employers Difficulty in Hiring Qualified People

Occupation	% of Employers with Difficulty* All	% Rural	% Urban
Data Entry Keyers	7.4%	3.3%	12.5%
Computer Programmers	44.4%	3.3%	58.3%
Computer System Analysts	25.9%	23.3%	29.2%
Computer Operators	3.7%	0.0%	8.3%
Electrical and Electronic Technicians	12.9%	10.0%	16.7%
Computer Programmer Aides	3.7%	0.0%	8.3%
Bookkeeping and Accounting Clerks	3.7%	0.0%	8.3%
Secretaries	11.1%	6.7%	16.7%
Total No. of Employers	54	30	24

* All is the percentage of employers with difficulty in hiring. Rural and urban are percentages of rural and urban employers with difficulty in hiring.

employers. To the extent difficulty in hiring delays expansion of the firm or results in expansion of own training facilities this suggests a possible shortage of qualified personnel. For the remaining occupations employers did not have problems in hiring qualified personnel. This lack of difficulty was shown in Table 2.737 as well as column 9 of Table 3.737.

insert Table 3.737 here

Overall Training Needs for Existing Employees

Computer programmers were most frequently cited by employers as needing training (Table 4.737). The greater need for training of computer programmers reflects the rapid changes in computer technology, especially computer languages. Table 4.737 also shows that computer programmer aides, followed by data entry keyers, are least cited as needing training. Possible explanation of the low training needs for data entry keyers and computer programmer aides include the expanded capabilities and increased user friendliness of computers. For example, direct data entry is replacing coding. More user friendly software as well as increased standardization of computer equipment makes formal training in software application less critical.

For most occupations, employers in both rural and urban areas share similar concerns about training needs of current employees. However, variations exist in some occupations. For instance, 17 percent of employers that needed training for data entry keyers are in the urban areas while only 7 percent of the rural employers felt training was needed. For electrical and electronic technicians 30 percent of rural employers believe there is a need for training, but only 13 percent of urban employers reported a need for training. Table 4.737 also indicates a disproportionate need for the training of secretaries and computer programmer aides by urban employers. So the occupational training needs do not consistently point to either a rural or urban emphasis.

One possible explanation for greater need for training of electrical and electronic technicians by employers in the rural areas could be the age profile of new entrants. About 8 out of 10 new entrants are between the ages of 25 and 34 [U.S. Department of Labor,1986]. These new entrants are younger workers and are more likely to prefer urban areas. Consequently, existing technicians in the rural industries will require extra training to keep abreast with new developments in the field.

TABLE 3.737

Computer Programming ETC - SIC 737

Employers Responses to Difficulty in Hiring Qualified Personnel*

(n = 54)

	Percent of Employers Using*								
Occupation	Promotion	Overtime	Job Redesign	Transfer	Expand Training	Raise Wages	Delay Expansion	Other	No Problem
Data Entry Keyers	5.6%	5.6%	0.0%	1.9%	5.6%	5.6%	1.9%	0.0%	31.5%
Computer Programmers	9.3%	9.3%	3.7%	3.7%	18.5%	22.2%	13.0%	3.0%	18.5%
Computer System Analysts	7.4%	3.7%	3.7%	3.7%	9.3%	11.1%	16.7%	1.8%	22.2%
Computer Operators	1.9%	3.7%	0.0%	1.9%	3.7%	0.0%	0.0%	0.0%	40.7%
Electrical and Electronic Technicians	1.9%	5.6%	5.6%	0.0%	9.3%	3.7%	3.7%	0.0%	35.2%
Computer Programmer Aides	0.0%	0.0%	0.0%	0.0%	1.9%	0.0%	1.9%	0.0%	44.4%
Bookkeeping and Accting. Clerks	1.9%	1.9%	1.9%	3.7%	3.7%	3.7%	1.9%	0.0%	38.8%
Secretaries	3.7%	1.9%	0.0%	1.9%	3.7%	3.7%	3.7%	1.8%	44.4%

* Multiple response permitted.

insert Table 4.737 here

Table 5.737 indicates that training needs are greater in larger firms than in smaller firms. For example, 54.5 percent of employers with fewer than 10 workers, compared with 70.8 percent of employers with 10 to 15 workers, and 73 percent with over 50 workers, think computer programmers needed training. This pattern is consistently shown in all the remaining occupations except for bookkeeping and accounting clerks, and secretaries. Even in those two occupations, the need for training was expressed more by employers with 10 to 50 employees than employers with fewer than 10 employees.

insert Table 5.737 here

Employers Training Method Preferences

Table 6.737 presents the responses to the type of training that employers prefer for the development and maintenance of employees skills.

In most occupations, employers prefer on-the-job training to other training sources. However, for computer programmers and computer system analysts employers have a slight preference for own in-house training, which is also the second most preferred form of training in most occupations after on-the-job training.

Table 6.737 also shows variation in the type of formal training preferred. In all occupations, own formal in-house training is preferred to customized training. Own formal in-house training is also preferred to formal outside training, except equipment suppliers training of electrical and electronic technicians.

Other formal outside training is slightly preferred to supplier sponsored training for data entry keyers, computer programmers, computer system analysts, bookkeeping and accounting clerks and secretaries. Only for electrical and electronic technicians, computer operators, and computer programmer aides do firms favor supplier organized training. The employers preference for formal outside training divided by type of job. This preference seems to reflect the need for employees who mechanically operate equipment to be trained by suppliers. Employers preferred training organized by other outside training organizations for those employees whose jobs involve understanding concepts underlying the operation of machines, or whose jobs are not related to specific equipment.

TABLE 4.737

Computer Programming ETC - SIC 737

Employers Belief That Current Employees Need Training by Location

Occupation	Total*	% Rural*	% Urban*
Data Entry Keyers	11.1%	6.7%	16.7%
Computer Programmers	63.0%	66.7%	58.3%
Computer System Analysts	46.3%	43.3%	50.0%
Computer Operators	25.9%	26.7%	25.0%
Electrical and Electronic Technicians	22.2%	30.0%	12.5%
Computer Programmer Aides	9.3%	6.7%	12.5%
Bookkeeping and Accounting Clerks	20.4%	23.3%	16.7%
Secretaries	13.0%	10.0%	16.7%
Total No. of employers	54	30	24

* Percent of total, rural, or urban employers that believe that current employees need training.

TABLE 5.737

Computer Programming ETC - SIC 737

Employers Beliefs That Current Employees Need Training by Firm Size

Occupation	All Employers*	Firm Employment Size* < 10	10-50	> 50
Data Entry Keyers	11%	9.1%	12.5%	12.5%
Computer Programmers	65%	54.5%	70.8%	75.0%
Computer System Analysts	46%	31.8%	45.8%	87.5%
Computer Operators	25%	13.6%	33.3%	37.5%
Electrical and Electronic Technicians	22%	18.2%	20.8%	37.5%
Computer Programmer Aides	9%	4.5%	8.3%	25.0%
Bookkeeping and Accounting Clerks	20%	9.1%	29.2%	25.0%
Secretaries	13%	0.0%	4.2%	0.0%
Number of Firms in Size Category	54	22	24	8

* Proportion of all firms or firms of this size believing that current employees need training.

insert Table 6.737 here

Occupational Preparation of Newly Hired Employees

Table 7.737 summarizes the respondents rating of the occupational preparation of their new hires. Bookkeeping and accounting clerks were most frequently given the highest occupational preparation rating: 19 percent of the respondents gave them the maximum rating of "very well prepared" and they received the highest average rating of 2.9 on a 4-point scale. Electrical and electronic technicians were the most frequently mentioned as "not well prepared", and also received the lowest average rating (1.3 on a 4-point scale).

The high rating for bookkeepers and accounting clerks and the low rating for electrical and electronic technicians does not make sense when one recognizes that both have similar length of training for new entrants [U.S. Department of Labor, 1986]. The difference may be an indication that the content of training for electrical and electronic technicians needs improvement to meet the requirements of firms in this sector.

insert Table 7.737 here

Adoption of Technology and Its Implication on Skills and Training

Examination of the relationship between firm size and the introduction of technology gives mixed results. Table 8.737 indicates that medium size firms are more likely than small or large firms to introduce integrated program design (I.P.D.). However, larger firms are relatively more likely to introduce artificial intelligence (A.I.T.) and fiber optics technology (F.O.T.) than are small firms. Thus, there is no general direct relationship between introduction of technology and the size of the firm. This reflects the availability of smaller integrated program systems with reduced start-up cost [Leontif and Faye, 1985] and the cheapness of fiber optics components [U.S. Department of Commerce, 1987] vis-a-vis the relatively more recent and high cost artificial intelligence technology (A.I.T.). Consequently, only larger firms can afford A.I.T., but firms of all sizes can afford I.P.D. and F.O.T.

insert table 8.737 here

TABLE 6.737

Computer Programming ETC - SIC 737

Employers Training Preferences*

(n = 54)

Occupation	Formal In-House Training Own	 Customized	Formal Outside Training Supplier	 Other	On-the-Job Training
Data Entry Keyers	22.2%	0.0%	0.0%	3.7%	27.8%
Computer Programmers	37.0	11.1	20.4	22.2	33.3
Computer System Analysts	33.3	11.1	20.4	22.2	33.3
Computer Operators	22.2	3.7	7.4	5.6	27.8
Electrical and Electronic Technicians	7.4	0.0	13.0	3.7	16.7
Computer Programmer Aide	14.8	0.0	5.6	3.7	14.8
Bookkeeping and Accounting Clerks	13.0	5.6	0.0	14.8	27.8
Secretaries	22.2	1.9	0.0	16.7	48.1

* Multiple responses permitted.

TABLE 7.737

Computer Programming ETC - SIC 737

Occupational Preparation of New Hires

Occupation	No. of Employers Responding	Occupational Preparation Rating* % Responding with: 1-point	4-points	Average Rating
Data Entry Keyers	18	0.0%	5.6%	2.7%
Computer Programmers	32	3.1%	12.5%	2.9%
Computer System Analysts	17	5.9%	5.9%	2.6%
Computer Operators	14	21.4%	7.1%	2.3%
Electrical and Electronic Technicians	13	23.1%	7.7%	1.3%
Computer Programmer Aides	23	4.3%	8.7%	2.7%
Bookkeeping and Accounting Clerks	27	3.7%	18.5%	2.9%
Secretaries	22	4.5%	4.5%	2.8%

* Rating is based on a 4-point scale:
4 - very well prepared.
1 - not well prepared.

TABLE 8.737

Computer Programming ETC - SIC 737

Firm Size and Adoption of Technology

Firm Employment Size	% of Firms Adopting Technology		
	I.P.D.*	A.I.T.*	F.O.T.*
Under 10	33%	17%	50%
10-50	61	50	17
Over 50	6	33	33
Total	18**	6**	6**

* I.P.D. is integrated program design.
A.I.T. is artificial intelligence technology.
F.O.T. is fiber optics technology.
** Total number of firms adopting technology.

TABLE 9.737

Computer Programming ETC - SIC 737

Firm Location and Adoption of Technology

Firm Employment Size	% of Firms Adopting Technology		
	I.P.D.*	A.I.T.*	F.O.T.*
Rural	61%	100%	71%
Urban	39	0	29
Total	18**	5**	7**

* I.P.D. is integrated program design.
A.I.T. is artificial intelligence technology.
F.O.T. is fiber optics technology.
** Total number of firms adopting technology.

Table 9.737 also shows that absolutely and relatively more of the employers who have introduced integrated program designs, artificial intelligence technology and fiber optics technology are in the rural areas. For instance, 56 percent of employers responding are in rural areas but 61 percent of firms that have introduced I.P.D. are in rural areas. The difference between rural and urban locations is more pronounced in the introduction of A.I.T and F.O.T. Possible explanations include the advances in electronic mail and other telecommunication which have rendered the location of firms in this industry footloose, and reduced the necessity of locating in urban centers.

insert Table 9.737 here

Between 10 and 46 percent of employers think that basic skills of workers will increase as a result of introducing new technologies (Table 10.737). Six percent or less believe that the introduction of technology will reduce the level of basic skills required by workers. Between 53 and 90 percent of the employers believe there will be no change in basic skills. Even though, a high percentage of employers believe no change in basic skill level will occur, few believe technology adoption will decrease basic skills required.

insert Table 10.737 here

Table 11.737 shows that employers are convinced that the introduction of technology will increase the technical skills required by all workers. The majority of employers believe technical skills needed in computer programming and computer system analysts will increase. The occupations employers believe least likely to experience technical skills increases are data entry keyers and computer programmer aides. The impact of technology on technical skills will affect all occupations in varying degrees. The greatest impact will be on occupations closely related to the new technologies like computer programmers and computer system analysts.

insert Table 11.737 here

TABLE 11.737

Computer Programming ETC - SIC 737

Adoption of Technology and Changes in Technical Skills

Occupation	No. of Employers Responding	% of Employers Reporting Changes in Technical Skills: Increase	No Change	Decrease
Data Entry Keyers	18	16.7%	83.3%	0.0%
Computer Programmers	30	66.7%	33.3%	0.0%
Computer System Analysts	26	69.2%	30.8%	0.0%
Computer Operators	21	23.8%	76.2%	0.0%
Electrical and Electronic Technicians	18	33.3%	61.1%	5.6%
Computer Programmer Aides	18	16.7%	72.2%	11.1%
Bookkeeping and Accounting Clerks	23	34.8%	65.2%	4.3%
All Secretaries	28	35.7%	57.1%	7.1%

TABLE 10.737

Computer Programming - SIC 737

Adoption of Technology and Changes in Basic Skills

Occupation	No. of Employers Responding	% of Employers Reporting Changes in Basic Skills:		
		Increase	No Change	Decrease
Data Entry Keyers	19	10.5%	89.5%	0.0%
Computer Programmers	30	43.3%	53.3%	3.3%
Computer System Analysts	24	45.8%	54.2%	0.0%
Computer Operators	20	10.0%	85.0%	5.0%
Electrical and Electronic Technicians	17	35.3%	58.8%	5.9%
Computer Programmer Aides	18	22.2%	72.2%	5.6%
Bookkeeping and Accounting Clerks	23	30.4%	65.2%	4.3%
All Secretaries	26	34.6%	61.5%	3.8%

Employers' responses to the importance of training in adapting to technological change is reported in Table 12.737. Again computer programmers followed by computer systems analysts were the two most frequently cited occupations in which training is considered "very important". Computer programmer aides require the least training in adapting to technological change.

insert Table 12.737 here

Summary

Main findings in the computer programming, data processing, and other computer related services sector include the following:

1. Employment growth is expected for the computer programming and computer system analysts occupations. Personnel for these occupations are also difficult to find, sometimes resulting in delays in expansion of operations. No employment change is expected in the other occupations surveyed.
2. Training is needed for all occupations, however, employers expressed greater training needs for computer programmers and computer system analysts. Generally, the need for training distribution among rural and urban employers is similar to the overall distribution of responses.
3. Employers generally prefer on-the-job training to formal in-house training. There is also a slight preference for other formal outside training over formal training by suppliers of equipment in the training of computer programmers and computer systems analysts. Own in-house training is also preferred to customized training.
4. Newly hired bookkeeping and accounting clerks are the most prepared workers among the occupations considered. Electrical and electronic technicians are among the least prepared, according to the survey response.
5. Smaller firms are less likely to be early adopters of expensive technology. This may be one reason for the low training need of smaller firms.
6. The impact of technology on basic and technical skills is not confined to technology related occupations. The tendency was to increase skills.

TABLE 12.737

Computer Programming ETC - SIC 737

The Importance of Training and Retraining in Adapting Employees to Technological Change

Occupation	Importance of Training* (4)	(3)	(2)	(1)	Average Importance
Data Entry Keyers	5.6%	11.1%	27.8%	55.6%	1.7%
Computer Programmers	44.8%	31.0%	13.8%	10.3%	3.1%
Computer System Analysts	41.7%	29.2%	12.5%	16.7%	3.0%
Computer Operators	16.7%	16.7%	27.8%	38.9%	2.1%
Electrical and Electronic Technicians	26.3%	26.3%	10.5%	36.8%	2.4%
Computer Programmer Aides	6.7%	13.3%	13.3%	66.7%	1.6%
Bookkeeping and Accounting Clerks	13.6%	18.2%	9.1%	59.1%	1.7%
Secretaries	13.9%	22.1%	12.25	25.4%	2.1%

* Graded on a scale of 1 (not very important) to 4 (very important).

The conclusion is that employers emphasize training needs of those occupations important for the advancement of technology, thus neglecting less technologically oriented occupations; and that training needs are greater in larger firms than in smaller firms in computer programming, data processing, and other computer services industries.

CHAPTER 8

ACCIDENT AND HEALTH INSURANCE AND MEDICAL SERVICE PLANS -SIC 632

This sector consists of establishments engaged in underwriting accident and health insurance, and those providing hospitals and medical services plans. The industry includes establishments which provide health insurance protection for disability income losses and medical expense coverage on an indemnity basis. It also includes establishments that provide hospital, medical, and other health services to subscribers in accordance with prearranged agreements or service plans. Also included in this sector are separate establishments of health maintenance organizations that provide medical insurance. The sector excludes establishments that provide medical insurance through their own facilities or employed physicians. Such establishments are classified under the major SIC group 80.

The accident and health insurance and medical services plan industry is part of the finance, insurance and real estate industry group (FIRE) in the state [DILHR, 1987]. FIRE is a major industry group in Wisconsin, contributing 5.4 percent of the 1987 nonfarm wage and salary employment base. Between 1982 and 1987 employment in the Wisconsin FIRE sector increased by 15.4 percent representing the second most rapid job increase among major sector groupings in the state. The accident and health insurance and medical services plan ranked sixth by job level in 1985 and fourth by number of additional jobs between 1982 and 1985 among industries in FIRE [DILHR, 1987].

Employment Growth and Difficulty in Hiring Qualified Personnel

Employment distribution for selected occupations in the five firms responding is presented in Table 1.632. Employment declined in almost all of the occupations between 1987 and 1988. However, employers expect 1989 employment increases for all occupations except for insurance sales workers which was the only occupation, besides secretaries, for which employment increased between 1987 and 1988. The reason for the sharp increase in employment for insurance sales workers in 1988 and the expected decline in 1989 is subject to speculation. First, the finding may have no empirical basis since the five respondents may not be representative. Assuming the respondents are representative then the finding suggests that in 1988 employers increased their sales work force in a competitive effort to gain market share, whereas in 1989 employers are consolidating market share.

insert Table 1.632

Table 2.632 is an examination of occupations in which employers found it difficult to hire qualified people. In general, employers had no difficulty in hiring qualified people to fill vacant positions. In three occupations none of the employers reported difficulty in hiring qualified people to fill positions. In each of the remaining occupations, only one out of five employers reported problems in hiring qualified personnel. Urban employers were the only ones reporting difficulty in hiring qualified personnel except for insurance sales clerks and secretaries which posed problems to rural employers.

insert Table 2.632 here

Table 3.632 summarizes employers responses to hiring difficulties. In most occupations 60 percent or more of the employers did not have difficulty in hiring qualified people. However, insurance adjusters and investigators, insurance claim clerks, and insurance sales clerks presented hiring difficulty of qualified personnel for 20 percent of the firms. These are firm specific occupations. The difficulty in hiring personnel to fill firm-specific positions may reflect the competition from other insurance firms. To resolve the difficulty in hiring personnel to the firm-specific occupations various methods were used. Raising wages was common in resolving the difficulty in hiring insurance adjusters and investigators, and insurance sales workers. Raising wages to resolve hiring difficulties may not by itself indicate an actual shortage, but a lack of enough incentives to attract people into the occupation. Expanding training, which suggests actual worker shortage, and transfers were also frequently cited for resolving difficulties in hiring people for the three occupations. A combination of these three methods of resolving difficulty in hiring qualified people for the three occupations suggests a forewarning of potential shortage of qualified personnel.

insert Table 3.632

TABLE 1.632

Accident and Health Insurance and Medical Service Plan - SIC 632

Employment Growth By Occupation

(n = 5)

Occupation	Employment 1987	Employment 1988	Employment Change 1987-1988 #	Employment Change 1987-1988 %	Expected Change 1989*
Insurance Adjusters and Investigators	143	117	-26	-18.2%	+
General Office Clerks	198	189	-9	-4.5%	+
Insurance Claims Clerks	424	361	-63	-14.9%	+
Data Entry Keyers	69	65	-4	-5.8%	+
Correspondence Clerks	12	12	0	0.0%	+
Bookkeeping & Accounting Clerks	118	117	-1	-0.8%	+
Insurance Sales Workers	58	78	20	34.5%	0
Accountants and Auditors	76	71	-5	-6.6%	+
File Clerks	10	7	-3	-30.0%	+
All Secretaries	82	85	3	3.7%	+
Total	1190	1102	-88	-7.4%	

* + means expected increase in employment.
0 means no change in employment is expected.
- means expected decrease in employment.

TABLE 2.632

Accident and Health Insurance and Medical Service Plan - SIC 632

Employers' Difficulty in Hiring Qualified People

Occupation	% of Employers with Difficulty* All	% Rural	% Urban
Insurance Adjusters and Investigators	20.0%	0.0%	33.3%
General Office Clerks	20.0%	0.0%	33.3%
Insurance Claims Clerks	20.0%	0.0%	33.3%
Data Entry Keyers	20.0%	0.0%	33.3%
Correspondence Clerks	0.0%	0.0%	0.0%
Bookkeeping & Accounting Clerks	0.0%	0.0%	0.0%
Insurance Sales Workers	20.0%	50.0%	0.0%
Accountants and Auditors	20.0%	0.0%	33.3%
File Clerks	0.0%	0.0%	0.0%
All Secretaries	20.0%	50.0%	0.0%

* All is the percentage of employers with difficulty in hiring. Rural and urban are percentages of rural and urban employers with difficulty in hiring.

TABLE 3.632

Accident and Health Insurance and Medical Service Plan - SIC 632

Employers' Responses to Difficulty in Hiring Qualified Personnel

(n - 9)

	Percent of Employers Using*								
Occupation	Promotion	Overtime	Job Redesign	Transfer	Expand Training	Raise Wages	Delay Expansion	Other	No Problem
Insurance Adjusters and Investigators	20.0%	20.0%	20.0%	40.0%	20.0%	20.0%	0.0%	0.0%	40.0%
General Office Clerks	20.0%	0.0%	20.0%	0.0%	40.0%	0.0%	0.0%	0.0%	60.0%
Insurance Claims Clerks	20.0%	20.0%	20.0%	20.0%	40.0%	0.0%	0.0%	0.0%	40.0%
Data Entry Keyers	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	80.0%
Correspondence Clerks	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	60.0%
Bookkeeping & Accounting Clerks	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	80.0%
Insurance Sales Workers	0.0%	0.0%	0.0%	0.0%	20.0%	20.0%	0.0%	0.0%	40.0%
Accountants and Auditors	0.0%	0.0%	0.0%	0.0%	0.0%	20.0%	0.0%	0.0%	60.0%
File Clerks	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	60.0%
All Secretaries	0.0%	0.0%	0.0%	20.0%	0.0%	20.0%	0.0%	0.0%	60.0%

* Multiple responses permitted.

Overall Training Needs For Existing Employees

Employers beliefs about training needs for current employees are summarized in Table 4.632. Eighty percent of the respondents said bookkeeping and accounting clerks needed extra training. Sixty percent of the respondents also said that insurance claim clerks and insurance sales workers needed extra training. In the remaining occupations forty percent or less of the employers believed current employees needed training.

The need for training insurance sales workers and insurance claim clerks reflects the critical role these workers play in the operation of the insurance industry. The sales worker projects the image of the company to the prospective buyer of the insurance whereas the efficiency of the claim clerks is crucial in maintaining customers confidence in the company. The need for training of insurance sales workers also reflects the low occupational preparation of new entrants (Table 7.632). The need for training of bookkeeping and accounting clerks indicates the magnitude of financial transactions in the industry's operations which require well trained personnel.

The distribution of training need among rural and urban employers generally suggests that in most occupations the need for training is higher in urban areas. This suggests that training efforts for workers in this industry should be focused in the urban areas.

insert Table 4.632 here

Employers beliefs about training needs also vary across firm size. In almost all the occupations a greater proportion of employers who believe that current employees need training are in larger firms. As shown in Table 5.632 the large employers (>50 workers) were more inclined to think current employees needed more training than did the smaller employers (<50 workers).

Even though these responses may not be representative, they still suggest that larger firms believe in training their current employees more than smaller firms.

insert Table 5.632 here

TABLE 4.632

Accident and Health Insurance and Medical Service Plan - SIC 632

Employers' Beliefs That Current Employees Need Training by Location

Occupation	Total	% Rural*	% Urban*
Insurance Adjusters and Investigators	40.0%	0.0%	66.7%
General Office Clerks	20.0%	0.0%	33.3%
Insurance Claims Clerks	60.0%	0.0%	100.0%
Data Entry Keyers	40.0%	50.0%	33.3%
Correspondence Clerks	40.0%	0.0%	66.7%
Bookkeeping & Accounting Clerks	80.0%	50.0%	100.0%
Insurance Sales Workers	60.0%	50.0%	66.7%
Accountants and Auditors	40.0%	0.0%	66.7%
File Clerks	0.0%	0.0%	0.0%
All Secretaries	40.0%	50.0%	33.3%

* Percent of total, rural, or urban employers that believe that current employees need training.

TABLE 5.632

Accident and Health Insurance and Medical Service Plan - SIC 632

Employers' Beliefs That Current Employees Need Training by Firm Size

(n - 10)

Occupation	All Employers*	Firm Employment Size*		
		< 50	51-100	> 100
Insurance Adjusters and Investigators	20%	0.0%	0.0%	100.0%
General Office Clerks	20%	0.0%	50.0%	0.0%
Insurance Claims Clerks	40%	0.0%	50.0%	50.0%
Data Entry Keyers	40%	0.0%	100.0%	0.0%
Correspondence Clerks	20%	0.0%	0.0%	0.0%
Bookkeeping & Accounting Clerks	60%	0.0%	100.0%	100.0%
Insurance Sales Workers	60%	100.0%	50.0%	100.0%
Accountants and Auditors	60%	0.0%	100.0%	100.0%
File Clerks	0%	0.0%	0.0%	0.0%
All Secretaries	40%	0.0%	100.0%	0.0%
Number of Firms in Size Category	5	1	2	1

* Proportion of all firms or firms of this size believing that current employees need training.

Employers Training Methods Preferences

Responses to the type of training that employers think is most effective for developing and maintaining overall knowledge and skills of employees are found in Table 6.632. The Table indicates that for most occupations employers prefer on-the-job training to all other types of training. In all occupations examined, on-the-job training is either the most preferred or as preferred as other types of training. Employers' second preference is formal in-house training. Preferences differ on the specific form of formal in-house training, but own training is preferred to customized formal in-house training. Formal outside training is generally the least preferred type of training. In all occupations, except secretarial, 20 percent or less of the employers indicated preference for formal outside training. For secretaries 40 percent of employers indicated a preference for formal outside training by equipment suppliers.

insert Table 6.632 here

Occupational Preparation of Newly Hired Employees

Table 7.362 presents the responses about the occupational preparation of newly hired workers. None of the occupations received the maximum rating of "very well prepared" from any of the respondents. However, 50 percent of respondents mentioned that insurance sales workers were "not well prepared." Insurance adjusters and investigators, and insurance claims clerks received the highest average rating of 2.7 on the 4-point scale while insurance sales workers received the lowest average rating of 1.5.

This finding is not surprising. Since claims are to a large extent predictable through actuarial projections than the volume of sales, the goals for insurance adjusters and investigators, and insurance claims clerks can be more specific than the goals set for insurance sales workers. Specific goals have been found to lead to higher performance than less specific goals. [Locke et al, 1978] Consequently, it is not surprising that employers rate insurance adjusters and investigators, and insurance claims clerks high and insurance sales workers low. Thus, the ratings represent performance rather than skill or occupational preparation.

insert Table 7.632 here

TABLE 6.632

Accident and Health Insurance and Medical
Service Plan - SIC 632

Employers' Training Preferences*

(n = 5)

Occupation	Formal In-House Training		Formal Outside Training		On-the-Job Training
	Own	Customized	Supplier	Other	
Insurance Adjusters and Investigators	60.0%	40.0%	0.0%	0.0%	40.0%
General Office Clerks	40.0%	0.0%	0.0%	0.0%	80.0%
Insurance Claims Clerks	40.0%	40.0%	0.0%	0.0%	80.0%
Data Entry Keyers	80.0%	0.0%	0.0%	0.0%	80.0%
Correspondence Clerks	60.0%	0.0%	0.0%	0.0%	80.0%
Bookkeeping & Accounting Clerks	60.0%	0.0%	0.0%	0.0%	80.0%
Insurance Sales Workers	60.0%	20.0%	20.0%	20.0%	40.0%
Accountants and Auditors	60.0%	0.0%	20.0%	20.0%	60.0%
File Clerks	40.0%	0.0%	0.0%	0.0%	80.0%
All Secretaries	40.0%	0.0%	40.0%	0.0%	80.0%

* Multiple responses permitted.

TABLE 7.632

Accident and Health Insurance and Medical Service Plan - SIC 632

Occupational Preparation of New Hires

Occupation	No. of Employers Responding	Occupational Preparation Rating* % of responding with: 1-point	4-points	Average Rating
Insurance Adjusters and Investigators	4	0.00%	0.00%	2.7
General Office Clerks	4	0.00%	0.00%	2.5
Insurance Claims Clerks	3	0.00%	0.00%	2.7
Data Entry Keyers	3	0.00%	0.00%	2.3
Correspondence Clerks	2	0.00%	0.00%	2.0
Bookkeeping & Accounting Clerks	4	0.00%	0.00%	2.5
Insurance Sales Workers	2	50.00%	0.00%	1.5
Accountants and Auditors	4	0.00%	0.00%	2.5
File Clerks	3	0.00%	0.00%	2.3
All Secretaries	4	0.00%	0.00%	2.5

* Rating is based on a 4-point scale.
4 - very well prepared.
1 - not well prepared.

Adoption of Technology and Its Implication on Skills and Training

The major new technology used in office environments like that of insurance companies in the 1980s is the computer. Table 8.632 indicates that all the firms surveyed use computers in their operations irrespective of their size. This reflects the inexpensiveness of computers and the versatility of computers in modern offices.

insert Table 8.632

Table 9.632 also indicates that firms surveyed use computers whether they are in urban or rural communities.

insert Table 9.632

Table 10.632 suggests the introduction of computers will increase the basic skills of insurance sales workers more than the other occupations. At the same time, up to 50 percent of the firms believe that the introduction of computers will reduce the basic skill requirement of workers. Most employers however believe that the introduction of computers will not change the basic skill requirements of workers. The data in Table 10.632 suggests that computers may not change the basic skill requirements of workers. However, if even the use of computers will change basic skills in the accident and health insurance industry the tendency is more towards an increase in basic skill requirement rather than a decline.

insert Table 10.632

Table 11.632 also shows that employers are more convinced that the introduction of computers will change the technical skills required by workers. Between 20 and 75 percent of employers reported increases in technical skills in all the occupations. A comparison of the range of responses to changes in basic skill and technical skills indicates that introduction of computers tend to increase technical skills more than basic skills

TABLE 8.632

Accident and Health Insurance and Medical Service Plan - SIC 632

Firm Size and Adoption of Technology

Size	Firms Adopting Computers
< 50	20%
50-100	40%
> 100	20%
Total	5*

* Total number of firms with computers.

TABLE 9.632

Accident and Health Insurance and Medical Service Plan - SIC 632

Firm Location and Adoption of Technology

Location of Firm	Firms Adopting Computers
Rural	40%
Urban	60%
Total	5

* Total number of firms with computers.

TABLE 10.632

Accident and Health Insurance and Medical
Service Plan - SIC 632

Adoption of Technology and Changes in Basic Skills

Occupation	No. of Employers Responding	% of Employers Reporting Changes in Basic Skills Increase	 No Change	 Decrease
Insurance Adjusters and Investigators	2	0.0%	100.0%	0.0%
General Office Clerks	5	0.0%	100.0%	0.0%
Insurance Claims Clerks	4	25.0%	50.0%	25.0%
Data Entry Keyers	5	0.0%	80.0%	20.0%
Correspondence Clerks	4	25.0%	25.0%	50.0%
Bookkeeping & Accounting Clerks	5	20.0%	60.0%	20.0%
Insurance Sales Workers	3	66.7%	33.3%	0.0%
Accountants and Auditors	5	20.0%	80.0%	0.0%
File Clerks	4	0.0%	75.0%	25.0%
All Secretaries	5	20.0%	80.0%	0.0%

insert Table 11.632 here

Employers responses to the importance of training in adapting employees to technological changes is presented in Table 12.632. Insurance adjusters and investigators, and insurance sales workers were the most frequently cited occupations in which training is considered by employers as "very important." In fact, all employers surveyed cited the two occupations as very important. None of the employers considered training as "very important" for adapting file clerks to technological change and 25 percent said training and retraining was not important.

insert Table 12.632 here

Summary

The main findings in the accident and health insurance and medical plan industry are as follows:

1. Employment declined in most occupations between 1987 and 1988. However, employers expect increases in employment for most occupations in 1989.
2. Employers do not have much difficulty in hiring qualified personnel to fill new positions indicating there isn't any actual or potential shortage of qualified personnel.
3. Insurance sales workers, insurance claims clerks, and bookkeeping and accounting clerks were the occupations in which a large proportion of employers felt there was need for additional training. More urban than rural employers felt that there was need for training and retraining current employees. The need for training and retraining was also more pronounced in larger firms than in smaller firms.
4. On-the-job training is preferred to formal in-house training and formal outside training in most occupations. Formal outside training is the least preferred type of training.
5. Insurance adjusters and investigators, and insurance claims clerks were given the highest occupational preparation rating. Insurance sales clerks were given the least occupational preparation rating.

TABLE 11.632

Accident and Health Insurance and Medical
Service Plan - SIC 632

Adoption of Technology and Changes in Technical Skills

Occupation	No. of Employers Responding	% of Employers Reporting Changes in Technical Skills		
		Increase	No Change	Decrease
Insurance Adjusters and Investigators	4	25.0%	75.0%	0.0%
General Office Clerks	5	20.0%	80.0%	0.0%
Insurance Claims Clerks	4	75.0%	25.0%	0.0%
Data Entry Keyers	5	20.0%	60.0%	20.0%
Correspondence Clerks	4	25.0%	50.0%	25.0%
Bookkeeping & Accounting Clerks	5	60.0%	40.0%	0.0%
Insurance Sales Workers	3	66.7%	33.3%	0.0%
Accountants and Auditors	5	60.0%	40.0%	0.0%
File Clerks	4	25.0%	50.0%	25.0%
All Secretaries	5	60.0%	40.0%	0.0%

TABLE 12.632

Accident and Health Insurance and Medical Service Plan - SIC 632

The Importance of Training and Retraining in Adapting Employees to Technological Change

Occupation	Importance of Training* (4)	(3)	(2)	(1)	Average Importance
Insurance Adjusters and Investigators	100.0%	0.0%	0.0%	0.0%	4.00
General Office Clerks	50.0%	25.0%	25.0%	0.0%	3.25
Insurance Claims Clerks	75.0%	25.0%	0.0%	0.0%	3.75
Data Entry Keyers	50.0%	50.0%	0.0%	0.0%	3.50
Correspondence Clerks	25.0%	75.0%	0.0%	0.0%	3.00
Bookkeeping & Accounting Clerks	40.0%	60.0%	0.0%	0.0%	3.40
Insurance Sales Workers	100.0%	0.0%	0.0%	0.0%	4.00
Accountants and Auditors	60.0%	40.0%	0.0%	0.0%	3.60
File Clerks	0.0%	50.0%	25.0%	25.0%	2.25
All Secretaries	60.0%	20.0%	0.0%	20.0%	3.20

* Importance graded on a scale of 1 (not very important) to 4 (very important).

6. The introduction of computers in the industry requires increases in the basic and technical skills of employees.

One conclusion is that employers have relatively less difficulty in hiring qualified workers to fill available positions in the accident and health insurance and medical plan industry. Also, employers' training needs are focussed on workers who are responsible for making the firms financially viable, such as insurance sales workers, insurance adjusters and investigators, and bookkeeping and accounting clerks.

CHAPER 9

COMPUTER AND OFFICE EQUIPMENT - SIC 357

This sector consists of establishments engaged in the manufacture of electronic computers, computer storage devices, computer terminals, computer peripheral equipments, calculating and accounting machines, and office machines. The importance of this industry in this study stems from the nature of work performed by firms in the industry which is uncharacteristic of manufacturing industries as a whole. The uniqueness of work in this industry is reflected in its high concentration of scientific personnel. More than 25 percent of employment in the U.S. computer manufacturing industry in 1986 consisted of engineers, technicians and systems analysts while production workers represented only 35 percent. For manufacturing as a whole production workers accounted for 68 percent of all jobs in 1986 [Personick, 1987]. According to Personick (p. 31), despite the general decline in employment in the manufacturing industry, employment in the engineering, scientific, and technical occupations continues to increase. Consequently, new jobs will emerge in the engineering scientific and technical occupations that will require more trained workers. These new jobs may also require new and different skills because of new innovations spurred by international competition. The keen competition from Japan and newly industrializing countries means technical superiority continues to be the major force determining who controls the computer hardware market [U.S. Department of Commerce, 1987].

In Wisconsin this industry occupies the eleventh position in absolute 1985 employment among the 26 high-technology industries. However, it is projected to add new jobs at the rate of 12.4 percent between 1985 and 1995, a seventh position in terms of employment growth among the high technology industries [DILHR, 1987].

Employment Growth and Difficulty in Hiring Qualified Workers

Distribution of employment for selected occupations in the three firms responding to the survey is shown in Table 1.357. Employment declined for four occupations while there was no employment change for the remaining occupations. Even though employment for electrical and electronic engineers and electrical and electronic assemblers and secretaries declined between 1987 and 1988, employers expect 1989 employment to increase. Employment declines for machine assemblers and welding machine operators registered in 1988 are expected to stabilize in 1989. More new jobs are also expected for electrical and electronic technicians.

insert Table 1.357 here

As might be expected, given the general decline in employment that employers had little difficulty in hiring workers in the most occupations. Only one respondent, an urban firm, reported difficulty in hiring electrical and electronic engineers. This difficulty may reflect competition among employers due to increased demand for engineers possibly resulting from occupational shifts from production workers to engineering workers rather than a shortage per se.

Table 3.375 confirms the lack of difficulty in hiring qualified workers in most of the occupations. In all occupations, except for machine assemblers and welding machine operators, employers felt there was no need for any strategy to resolve difficulty in hiring, since that problem did not exist. Even for the machine assemblers and welding machine operators employers promoted current employees to fill vacant positions. This probably suggests that qualified people were available even within the firms to fill such positions.

insert Table 3.357 here

Overall Training Needs for Existing Employees

None of the employers think any of their current employees needed further training. A possible explanation here could be that there are more qualified workers available so that further training of personnel is not needed. Another explanation is training of workers is not viewed as feasible when levels of employment are being reduced.

TABLE 1.357

Electrical Industrial Apparatus - SIC 357

Employment Growth By Occupation

(n = 3)

Occupation	Employment 1987	Employment 1988	Employment Change 1987-1988 #	Employment Change 1987-1988 %	Expected Change 1989*
Machine Assemblers	5	1	-4	-80.0%	0
Inspectors, Testers, and Graders	3	3	0	0.0%	0
Electric and Electronic Assemblers	2	1	-1	-50.0%	+
Electric and Electronic Engineers	4	2	-2	-50.0%	+
Electric and Electronic Technician	3	3	0	0.0%	+
Welding Machine Operators	1	0	-1	-100.0%	0
All Secretaries	1	0	-1	-100.0%	-
Total	19	10	-9	-47.4%	

* + means expected increase in employment.
0 means no change in employment is expected.
- means expected decrease in employment.

TABLE 3.357

Electrical Industrial Apparatus - SIC 357

Employers' Responses to Difficulty in Hiring Qualified Personnel

(n = 3)

Occupation	Percent of Employers Using*								
	Promotion	Overtime	Job Redesign	Transfer	Expand Training	Raise Wages	Delay Expansion	Other	No Problem
Machine Assemblers	33.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Inspectors, Testers, and Graders	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	33.3%
Electric and Electronic Assemblers	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	33.3%
Electric and Electronic Engineers	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	33.3%	33.3%
Electric and Electronic Technician	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	33.3%
Welding Machine Operators	33.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
All Secretaries	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	33.3%

* Multiple responses permitted.

Employers Training Methods Preferences

On-the-job training was the training method of choice across all occupations. Own formal in house training was the second preferred method. These both re-enforce the perception of minimal expenditures for workforce training in this sector.

insert Table 6.357 here

Occupational Preparation of Newly Hired Employees

Table 7.357 summarizes responses to the occupational preparation of recently hired employees. No respondent gave any of the occupations a "not well prepared" rating. However one third of the respondents rated electrical and electronic assemblers, electrical and electronic engineers, electrical and electronic technicians, and secretaries as "very well prepared." Electrical and electronic engineers received the highest average rating of 3.0 on a 4-point scale, while welding machine operators received the lowest average rating of 0.7. The average ratings of employee preparation were among the lowest in all SIC's surveyed.

insert Table 7.357 here

Adoption of Technology and Its Implication on Skills and Training

There were no responses to the questions on technology, skill changes, and the need for training in adapting employees to technological changes. The reason for the lack of response is not obvious. It could mean that employers surveyed had not introduced any new technologies in the past two years or that the questionnaire was completed by someone who did not know. Since answers to the subsequent questions derive from the question on technology adoption none of them were answered.

TABLE 6.357

Electrical Industrial Apparatus - SIC 357

Employers Training Preferences*

(n = 3)

Occupation	Formal In-House Training		Formal Outside Training		On-the-Job Training
	Own	Customized	Supplier	Other	
Machine Assemblers	0.0%	0.0%	0.0%	0.0%	33.3%
Inspectors, Testers, and Graders	33.3%	0.0%	0.0%	0.0%	33.3%
Electric and Electronic Assemblers	33.3%	0.0%	0.0%	0.0%	33.3%
Electric and Electronic Engineers	33.3%	0.0%	33.3%	0.0%	33.3%
Electric and Electronic Technician	33.3%	0.0%	0.0%	0.0%	33.3%
Welding Machine Operators	0.0%	0.0%	0.0%	0.0%	33.3%
All Secretaries	0.0%	0.0%	0.0%	0.0%	33.3%

* Multiple responses permitted.

TABLE 7.357

Electrical Industrial Apparatus - SIC 357

Occupational Preparation of Employees

Occupation	No. of Employers Responding	Occupational Preparation Rating* % of responding with: 1-point	4-points	Average* Rating
Machine Assemblers	3	0.0%	0.0%	1.0
Inspectors, Testers, and Graders	3	0.0%	0.0%	0.0
Electrical and Electronic Assemblers	3	0.0%	33.3%	2.3
Electrical and Electronic Engineers	3	0.0%	33.3%	3.0
Electrical and Electronic Technician	3	0.0%	33.3%	1.3
Welding Machine Operators	3	0.0%	0.0%	0.7
All Secretaries	3	0.0%	33.3%	1.3

* Rating is based on a 4-point scale.
4 - very well prepared.
1 - not well prepared.

Summary

The main findings in the computer and office equipment industry include the following:

1. Employment declined in most of the occupations between 1987 and 1988. In 1989 employment is expected to stay the same or increase even in occupations that suffered decline in 1988.
2. Employers lack of difficulty in hiring workers in most occupations, must be tempered by the general employment decline.
3. Employers did not express any need of training for current employees. This response is not surprising, given the recent decline in employment.
4. Most employers prefer on-the-job training to other training methods.
5. Newly hired electrical and electronic engineers were rated as the most "well prepared" workers.

The conclusion is that the number of questionnaires returned (3) is too few to make any judgement. The three firms' responses indicate a decline in employment contrary to the aggregate projections. This may, however, imply industry-wide forewarning of employment decline.

CHAPTER 10

ELECTRICAL TRANSMISSION AND DISTRIBUTION EQUIPMENT MANUFACTURING - SIC 361

This sector consists of establishments engaged in the manufacture of power, distribution, and specialty transformers. It also includes industries engaged in the manufacture of switchgear and switchboard apparatus like power switches, circuit breakers, power switching equipment, switchboards and cubicles, control and metering panels, fuses and fuse mountings, and similar switchboard apparatus and supplies.

The electrical transmission and distribution equipment industry is a major high technology industry in Wisconsin. The industry employed 5,930 workers in 1985 and is projected to employ 6,480 workers in 1995 [DILHR, 1987]. The 550 new jobs represents a 9.2 percent increase in employment which exceeds the 5.8 percent increase projected for the entire manufacturing sector.

Employment Growth and Difficulty in Hiring Qualified Personnel

Employment distribution for selected occupations in the nine firms responding is shown in Table 1.361. Employment increased for all but one occupation in 1988. Most of the new jobs were for electrical and electronic assemblers and coil winders, tapers, and finishers. The only occupation for which there was a decline was drafters. Though the decline in employment for drafters is not very significant, it was also the only occupation in the engineering laboratory research instrument industry (SIC 381) for which employment declined in 1988. The employment decline of drafters may reflect the increasing use of computer aided-design systems (CAD). These systems do not necessarily reduce the demand for drafters. Yet, there is the tendency for less qualified drafters doing routine work and those unable or unwilling to switch to CAD to be laid off [U.S. Department of Labor, 1986]. Consequently, even though employers will continue to employ people with the knowledge in drafting fundamentals and design theory, exposure to computer aided-design techniques may be helpful.

Table 1.361 also shows that 1989 employment for most occupations is expected to decline. However, new 1989 jobs are expected for electrical and electronic assemblers while the employment level of electrical and electronic engineers remains unchanged. The sudden expected decline in employment for most occupations reflects the volatility in the industry which is tied to seasonal instabilities in housing construction and the electric utilities, the major customers of the electrical transmission and distribution industry.

insert Table 1.361

Occupations that employers find it difficult to hire qualified people are presented in Table 2.361. Employers have the greatest difficulty in hiring electrical and electronic technicians (55.6 percent) and electrical and electronic assemblers (55.6 percent), followed by coil winders, tapers and finishers (44.4 percent). In the remaining occupations, fewer than 33 percent of the employers reported difficulties in hiring. Employers in the urban areas face relatively more hiring difficulties than rural employers.

The difficulty in hiring electrical and electronic technicians reflects the faster than average employment growth for the occupation [U.S. Department of Labor, 1986]. The problem is made more difficult because of the competition from numerous sectors for electrical and electronics technicians. (For example, electrical and electronic technicians are employed in manufacturing, wholesale trade, and by federal, state, and local governments.) Moreover, because employers often look for technicians trained in specific areas (e.g., automatic control devices or electronic amplifiers), this makes it even more difficult to find qualified persons.

insert Table 2.361 here

Table 3.361 shows that employers overcome the difficulty in hiring qualified personnel mostly by the use of overtime, then promotion, and then training expansion. For electrical and electronic technicians which poses the greatest hiring difficulty overtime, job redesign, and transfers are used.

insert Table 3.361 here

Overall Training Needs For Existing Employees

Table 4.361 indicates that 78 percent of employers believe that drafters, electrical and electronic assemblers, and coil winder, tapers, and finishers need additional training. In the remaining occupations,

TABLE 1.361

Electrical Transmission and Distribution Equipment Manufacturing - SIC 361

Employment Growth By Occupation

(n = 9)

Occupation	Employment 1987	Employment 1988	Employment Change 1987-1988 #	Employment Change 1987-1988 %	Expected Change 1989*
Electrical and Electronic Assemblers	129	157	28	21.7%	+
Coil Winders, Tapers, and Finishers	50	67	17	34.0%	-
Inspectors, Testers, and Graders	13	13	0	0.0%	-
Electrical and Electronic Engineers	21	26	5	23.8%	0
Welders and Cutters	63	63	0	0.0%	-
Electrical and Electronic Technician	19	25	6	31.6%	-
Drafters	25	24	-1	-4.0%	-
All Other Secretaries	24	25	1	4.2%	-
Total	344	400	56	16.3%	

* + means expected increase in employment.
0 means no change in employment is expected.
- means expected decrease in employment.

TABLE 2.361

Electrical Transmission and Distribution Equipment Manufacting - SIC 361

Employers' Difficulty in Hiring Qualified People

Occupation	Employers with Difficulty*		
	All	% Rural	% Urban
Electrical and Electronic Assemblers	55.6%	50.0%	57.1%
Coil Winders, Tapers, and Finishers	44.4	0.0	57.1
Inspectors, Testers, and Graders	33.3	0.0	42.9
Electrical and Electronic Engineers	22.2	0.0	28.6
Welders and Cutters	22.2	0.0	28.6
Electrical and Electronic Technician	55.6	50.0	57.1
Drafters	22.2	0.0	28.6
All Other Secretaries	0.0	0.0	0.0
Total No. of Employers	9	2	7

* All is the percentage of employers with difficulty in hiring. Rural and urban are percentages of rural and urban employers with difficulty in hiring.

TABLE 3.361

Electrical Transmission and Distribution Equipment Manufacting - SIC 361

Employers' Responses to Difficulty in Hiring Qualified Personnel

(n - 9)

	Percent of Employers Using*								
Occupation	Promotion	Overtime	Job Redesign	Transfer	Expand Training	Raise Wages	Delay Expansion	Other	No Problem
Electrical and Electronic Assemblers	33.3%	44.4%	0.0%	11.1%	33.3%	11.1%	0.0%	0.0%	11.1%
Coil Winders, Tapers, and Finishers	22.2%	33.3%	0.0%	11.1%	11.1%	0.0%	11.1%	0.0%	11.1%
Inspectors, Testers, and Graders	33.3%	33.3%	0.0%	11.1%	22.2%	0.0%	0.0%	0.0%	22.2%
Electrical and Electronic Engineers	11.1%	0.0%	0.0%	0.0%	0.0%	0.0%	11.1%	0.0%	11.1%
Welders and Cutters	22.2%	22.2%	0.0%	0.0%	22.2%	11.1%	11.1%	0.0%	22.2%
Electrical and Electronic Technician	11.1%	22.2%	22.2%	22.2%	0.0%	11.1%	11.1%	0.0%	11.1%
Drafters	0.0%	22.2%	0.0%	0.0%	0.0%	11.1%	0.0%	0.0%	33.3%
All Other Secretaries	11.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	44.4%

* Multiple responses permitted.

between 33 and 44 percent of the employers believe there is a need for supplemental training. This sector had one of the highest rates of concern about training current employees in the manufacturing sector. A possible explanation for the high training needs could be the major technological advances in the industry. For example, recent advances in material technology (e.g., the use of an amorphous alloy in the production of transformers) has the potential to cut annual energy cost by millions of dollars [U.S. Department of Commerce, 1987], but may require additional training by employers. Urban firms were generally more concerned about training current workers than were rural firms.

insert Table 4.361 here

Table 5.361 shows that training needs vary across occupations within employment size category. For instance, in smaller firms a greater percentage of employers believed that assembly jobs such as electrical and electronic assemblers, coil winders, tapers, and finishers, need training supplements compared with the percentage in other occupations. In the medium sized firms, the same percentage of employers (50 percent) considered all occupations as needing extra training. In the large firms electrical and electronic engineers, drafters, electrical and electronic assemblers, and coil winders, tapers and finishers were most frequently cited as needing training. The high need for training of assembly workers in small firms may reflect that smaller firms specialize in assembly. Meanwhile, the need for training engineers and technicians, in addition to the assembly jobs in the large firms, may reflect that these large firms are involved in more complicated processes requiring well trained engineers in addition to the normal assembly of products.

insert Table 5.361 here

TABLE 4.361

Electrical Transmission and Distribution Equipment Manufacting - SIC 361

Employers' Beliefs That Current Employees Need Training by Location

Occupation	Total	% Rural*	% Urban*
Electrical and Electronic Assemblers	77.8%	50.0%	85.7%
Coil Winders, Tapers, and Finishers	77.8%	50.0%	85.7%
Inspectors, Testers, and Graders	44.4%	0.0%	57.1%
Electrical and Electronic Engineers	66.7%	0.0%	85.7%
Welders and Cutters	44.4%	0.0%	57.1%
Electrical and Electronic Technician	55.6%	50.0%	57.1%
Drafters	77.8%	50.0%	85.7%
All Other Secretaries	33.3%	0.0%	42.9%
Total No. of Employers	9	2	7

* Percent of total, rural, or urban employers that believe that current employees need training.

TABLE 5.361

Electrical Transmission and Distribution Equipment Manufacting - SIC 361

Employers' Beliefs That Current Employees Need Training by Firm Size

Occupation	All Employers*	Firm Employment Size*		
		< 25	26-100	> 200
Electrical and Electronic Assemblers	78%	100.0%	50.0%	100.0%
Coil Winders, Tapers, and Finishers	78%	100.0%	50.0%	100.0%
Inspectors, Testers, and Graders	44%	33.3%	50.0%	50.0%
Electrical and Electronic Engineers	66%	66.7%	50.0%	100.0%
Welders and Cutters	44%	33.3%	50.0%	50.0%
Electrical and Electronic Technician	55%	66.7%	50.0%	50.0%
Drafters	78%	100.0%	50.0%	100.0%
All Other Secretaries	33%	33.3%	50.0%	0.0%
Number of Firms in Size Category	9	3	4	2

* Proportion of all firms or firms of this size believing that current employees need training.

Employers Training Methods Preferences

Table 6.361 shows that in half of the occupations employers prefer formal in-house training to all other forms of training. Unlike the pattern in most industries surveyed, employers prefer formal training to on-the-job training for even assembly jobs like electrical and electronic assemblers, and coil winders, tapers, and finishers. The preference for type of formal in-house training is equally divided between own in-house training and customized training for all, but one, occupation.

Except for secretaries, on-the-job training is the most preferred form of training for the remaining four occupations. Thus employers prefer on-the-job training for the relatively more technical jobs like electrical and electronic engineers, electrical and electronic technicians, and welders and cutters. The preference for on-the-job training and formal in-house training for most occupations probably is an indication of the specificity of operations in the industry.

insert Table 6.361 here

Occupational Preparation Of Newly Hired Employees

Table 7.361 shows that inspectors, testers, and graders were most frequently given the highest occupational preparation rating. A third of the respondents gave them the maximum rating of "very well prepared" even though they did not receive the highest average rating. Coil winders, tapers, and finishers were most frequently given the lowest "not well prepared" rating and also received the lowest average rating of 1.8 on a 4-point scale. Average rating for all the occupations ranged between 1.8 and 3.3. Electrical and electronic engineers, electrical and electronic technicians, and drafters received the highest average rating of 3.3 on a 4-point scale. The high ratings for these three occupations is not surprising since most entrants have post-secondary training in technical schools or colleges. The low rating for coil winder, tapers, and finishers reflects that most of them must learn after they are hired.

insert Table 7.361 here

TABLE 6.361

Electrical Transmission and Distribution Equipment Manufacting - SIC 361

Employers' Training Preferences*

(n - 9)

Occupation	Formal In-House Training		Formal Outside Training		On-the-Job Training
	Own	Customized	Supplier	Other	
Electrical and Electronic Assemblers	71.4%	71.4%	14.3%	14.3%	14.3%
Coil Winders, Tapers, and Finishers	57.1%	57.1%	0.0%	14.3%	14.3%
Inspectors, Testers, and Graders	57.1%	57.1%	28.6%	14.3%	14.3%
Electrical and Electronic Engineers	42.9%	57.1%	42.9%	28.6%	57.1%
Welders and Cutters	28.6%	28.6%	14.3%	14.3%	42.9%
Electrical and Electronic Technician	42.9%	42.9%	57.1%	42.9%	71.4%
Drafters	57.1%	57.1%	14.3%	14.3%	42.9%
All Other Secretaries	42.9%	14.3%	14.3%	71.4%	57.1%

* Multiple responses permitted.

TABLE 7.361

Electrical Transmission and Distribution Equipment Manufacting - SIC 361

Occupational Preparation of New Hires

Occupation	No. of Employers Responding	Occupational Preparation Rating* % of responding with: 1-point	4-points	Average Rating
Electrical and Electronic Assemblers	7	42.9%	0.0%	2.0
Coil Winders, Tapers, and Finishers	4	50.0%	0.0%	1.8
Inspectors, Testers, and Graders	3	0.0%	33.3%	2.7
Electrical and Electronic Engineers	4	0.0%	25.0%	3.3
Welders and Cutters	4	0.0%	25.0%	3.3
Electrical and Electronic Technician	5	0.0%	20.0%	3.0
Drafters	4	0.0%	25.0%	3.3
All Other Secretaries	5	0.0%	20.0%	2.8

* Rating is based on a 4-point scale.
4 - very well prepared.
1 - not well prepared.

Adoption of Technology and Its Implication on Skills and Training

Table 8.361 indicates that while smaller and larger firms have installed computers only larger firms (employment above 200) have introduced the other technologies. Even though two responses are too few to make any judgments, it suggests that larger firms are more likely to introduce new technologies, placing competitive pressures on smaller firms and their workforce.

insert Table 8.361 here

The few responses also prevents judgement on whether new technology adoption is influenced by the location of a firm. The few responses however indicate that all firms that have introduced any of the technologies suggested are located in the urban areas, placing competitive pressure on rural firms and their workforce.

insert Table 9.361 here

Table 10.361 indicates that between 33 and 75 percent of employers responding believe the basic skill requirements of workers have increased due to the introduction of new technologies. In some occupations, like drafters and welders, the proportion of employers reporting an increase in basic skills exceed those reporting no change in basic skills. This may suggest that the use of computer-numerically-controlled machine tools (CNC), and computer-aided design (CAD) systems require drafters and cutters to know the basics of computer operation. None of the employers surveyed reported a decline in basic skills level in any of the occupations. For most occupations however a larger proportion of employers think that basic skills have not changed. Nevertheless, one can conclude that introducing new technology will not decrease the basic skill requirements needed by workers in this field.

insert Table 10.361 here

TABLE 8.361

Electrical Transmission and Distribution Equipment Manufacting - SIC 361

Firm Size and Adoption of Technology

Size of Firm	% of Firms Adopting Technology			
	COM	CHC	AGV	SPC
< 25	50.0%	0.0%	0.0%	0.0%
26-100	0.0	0.0	0.0	0.0
> 200	50.0	100.0	100.0	100.0
Total	2*	1*	1*	1*

COM is computers.
CNC is computer-numerically-controlled machines.
AGV is automated guided vehicles.
SPC is statistical process control.
* Total number of firms adopting technology.

TABLE 9.361

Electrical Transmission and Distribution Equipment Manufacting - SIC 361

Firm Location and Adoption of Technology

Location of Firm	% of Firms Adopting Technology			
	COM	CNC	AGV	SPC
Rural	0.0%	0.0%	0.0%	0.0%
Urban	100.0	100.0	100.0	100.0
Total	2*	1*	1*	1*

COM is computers.
CNC is computer-numerically-controlled machines.
AGV is automated guided vehicles.
SPC is statistical process control.
* Total number of firms adopting technology.

TABLE 10.361

Electrical Transmission and Distribution Equipment Manufacting - SIC 361

Adoption of Technology and Changes in Basic Skills

Occupation	No. of Employers Responding	% of Employers Reporting Changes in Basic Skills		
		Increase	No Change	Decrease
Electrical and Electronic Assemblers	3	33.3%	66.7%	0.0%
Coil Winders, Tapers, and Finishers	5	40.0%	60.0%	0.0%
Inspectors, Testers, and Graders	3	33.3%	66.7%	0.0%
Electrical and Electronic Engineers	3	33.3%	66.7%	0.0%
Welders and Cutters	4	75.0%	25.0%	0.0%
Electrical and Electronic Technician	3	33.3%	66.7%	0.0%
Drafters	3	66.7%	33.3%	0.0%
All Other Secretaries	4	50.0%	50.0%	0.0%

Table 11.361 shows that introduction of technology is more likely to increase technical skill requirements of most workers than to lower them. Across all occupations, none of the employers think that introduction of new technologies have reduced the technical skill requirements of employees. However, in most occupations employers think that introduction of new technology has not changed the technical skill requirements of workers.

In occupations such as inspectors, testers,and graders, and drafters a larger proportion of employers think that technology has increased the technical skill requirements. This reflects that unlike welders and cutters who require only the basic operation of CNCs, drafters and inspectors, testers, and graders require more technical knowledge in order to perform their duties well. For instance, the use of computer-aided design (CAD) systems has stimulated the demand for more complex design information.

insert Table 11.361 here

Table 12.361 summarizes employers' responses to the importance of training in adapting employees to technological change. Inspectors, testers, and graders, and electrical and electronic engineers were the occupations in which employers considered training as "very important" in adapting to technological change. Welders and cutters require the least training in adapting to technological change. Column 5 of Table 12.361 indicates that inspectors, testers, and graders, and electrical and electronic engineers received the highest "average importance" in adapting employees to technological change. Drafters received the second highest importance rating.

The importance of training and retraining in adapting inspectors, testers, graders, and drafters to technological changes suggests that introduction of technology increases the technical skill requirements of these occupations. An indication of this trend is shown in Table 11.361. The increase in technical skills thus requires training and retraining in order to adapt them to the new technologies.

insert Table 12.361 here

TABLE 11.361

Electrical Transmission and Distribution Equipment Manufacting - SIC 361

Adoption of Technology and Changes in Technical Skills

Occupation	No. of Employers Responding	% of Employers Reporting Changes in Technical Skills		
		Increase	No Change	Decrease
Electrical and Electronic Assemblers	4	25.0%	75.0%	0.0%
Coil Winders, Tapers, and Finishers	2	0.0%	100.0%	0.0%
Inspectors, Testers, and Graders	3	66.7%	33.3%	0.0%
Electrical and Electronic Engineers	3	33.3%	66.7%	0.0%
Welders and Cutters	3	33.3%	66.7%	0.0%
Electrical and Electronic Technician	4	25.0%	75.0%	0.0%
Drafters	3	66.7%	33.3%	0.0%
All Other Secretaries	3	33.3%	66.7%	0.0%

TABLE 12.361

Electrical Transmission and Distribution Equipment Manufacting - SIC 361

The Importance of Training and Retraining in Adopting Employees to Technological Change

(n-9)

Occupation	Importance of Training* (4)	(3)	(2)	(1)	Average Importance
Electrical and Electronic Assemblers	0.00%	100.00%	0.00%	0.00%	3.00
Coil Winders, Tapers, and Finishers	0.00	100.00	0.00	0.00	3.00
Inspectors, Testers, and Graders	66.67	33.33	0.00	0.00	3.66
Electrical and Electronic Engineers	66.67	33.33	0.00	0.00	3.66
Welders and Cutters	33.33	33.33	0.00	33.33	2.67
Electrical and Electronic Technician	0.00	100.00	0.00	0.00	3.00
Drafters	33.33	66.67	0.00	0.00	3.33
All Other Secretaries	0.00	100.00	0.00	0.00	3.00

* Importance graded on a scale of 1 (not very important) to 4 (very important).

Summary

The major findings in the electrical transmission and distribution equipment industry are as follows:

1. In 1988, employment increased or remained the same in all occupations except for drafters which experienced a slight decline. However, employers expect layoffs in most occupations that had increases or remained the same in 1988 as well as for drafters. The employment decline for drafters in 1988 and the continual decline in 1989 suggests a slow but steady displacement of less qualified drafters, most likely, by the introduction of CAD. This new technology requires additional training to the traditional drafting methods.

2. A relatively higher proportion of employers among manufacturing industries surveyed, reported need for added training of workers in all occupational categories. The proportion of employers reporting training needs was particularly high for drafters and workers in assembling occupations.

3. The need for supplemental training was higher for assembling jobs in smaller firms than in medium and large firms, probably because the smaller firms do more assembling than actual fabrication. The need for training was expressed equally for all occupations by employers in medium sized firms, probably because assembly and fabrication are integrated in such firms. Finally, the need for training engineers was higher in large firms than in medium or small firms. This may also suggest that large firms do more complicated processes requiring additional training of engineers than do either medium or small firms.

3. Employers prefer on-the-job training for technology oriented-occupations like engineers and technicians, and formal in-house training for less technology-oriented occupations like coil winders, tapers, and finishers and electrical and electronic assemblers.

4. Newly hired coil winders, tapers, and finishers were the least occupationally prepared workers while electronic engineers and technicians, and drafters were the best prepared. The lower preparation of these less technology-oriented occupations may be an indication as to why employers prefer formal in-house training. Probably the formal in-house training is to make up deficiencies in basic reading and writing skills as well as upgrading job-related skills.

5. There were too few responses to make a judgement on the relationship between firm size and the introduction of technology.

6. A larger proportion of employers reported that the introduction of new technology increases basic skill requirements of drafters, and welders and cutters. Technical skill requirements are also believed to increase in most occupations requiring most employees to need at least some technical training.

The conclusion is that employers use formal in-house training to improve the overall preparation of the less prepared workers in mostly assembly jobs, while on-the job training is used to improve the skills of better prepared workers.

CHAPTER 11

ELECTRICAL INDUSTRIAL APPARATUS - SIC 362

This industry includes establishments primarily engaged in the manufacture of electric motors and power generators; motor generator sets; railway motors and control equipment; and motors, generators, and control equipment for gasoline, electric, and oil-electric buses and trucks. It also includes establishments that manufacture carbon and graphite products; relays, motor starters and controllers, and other industrial controls and controls accessories; and capacitors and rectifiers for industrial application. The sector excludes establishments engaged in the manufacture of starting motors and battery charging generators for internal combustion engines, generators for welding machines, and turbogenerators.

The electrical industrial apparatus industry is a major part of the durable goods subsector in Wisconsin. It employed the second highest number of workers in the electrical machinery industry, which represents 16 percent of employment in the durable goods industries subsector. The industry is one of three industries projected to provide more than half of the new jobs in the high technology industries in Wisconsin by 1995 [DILHR 1987].

Employment Growth and Difficulty in Hiring Qualified Personnel

Distribution of employment for selected occupations in the ten firms responding is shown in Table 1.362. Employment increased for all the occupations in 1988 and is expected to continue through 1989 for all occupations except drafters. Employment for drafters is expected to remain the same in 1989. The greatest 1987 to 1988 employment rate increase was for coil winders, tapers, and finishers. However, electric and electronic assembly jobs accounted for 45 percent of the total change. The firms responding reported relatively lower employment growth for the technical and engineering positions even though recent projections suggest otherwise.

insert Table 1.362 here

TABLE 1.362

Electrical Industrial Apparatus - SIC 362

Employment Growth By Occupation

(n = 10)

Occupation	Employment 1987	Employment 1988	Employment Change 1987-1988 #	Employment Change 1987-1988 %	Expected Change 1989*
Coil Winders, Tapers, and Finishers	53	137	84	158.5%	+
Electrical and Electronic Assemblers	566	736	170	30.0%	+
Electrical and Electronic Engineers	134	177	43	32.1%	+
Inspectors, Testers, and Graders	186	189	3	1.6%	+
Lathe Turning Machine Setter or Operator	20	42	22	110.0%	+
Electromechanical Equip. Assembler	57	59	2	3.5%	+
Drafters	21	30	9	42.9%	0
Electrical and Electronic Technician	45	59	14	31.1%	+
Machine Assemblers	7	11	4	57.1%	+
All Other Secretaries	34	63	29	85.3%	+
Total	1123	1503	380	33.8%	

* + means expected increase in employment.
0 means no change in employment is expected.
- means expected decrease in employment.

Table 2.362 indicates that employers seldom have difficulty in hiring workers in the various occupations. The occupation with the greatest difficulty in hiring was electrical and electronic engineering but for only 30 percent of respondents. The relative minimal difficulty in hiring workers in the various occupations reflects the availability of qualified workers in manufacturing occupations. The number of observations of rural/urban firms is really too small to be useful.

insert Table 2.362 here

Table 3.362 summarizes the question about the strategies used by employers in resolving hiring difficulties. It is clear (just as reported in Table 2.362) that for all the occupations, the majority of (at least 55 percent) employers had no problem in hiring qualified people. In the few cases where difficulties were encountered, promotion, training expansion, and delay in expansion were used. Electrical and electronic engineers, electrical and electronic technicians, and machine assemblers were the only occupation that wage increases were used as a strategy in resolving hiring difficulty. Electrical and electronic engineers were the only occupation with at least 27 percent of the firms reporting difficulty in hiring (see Table 2.362). This difficulty may not suggest shortage of qualified people, but wage competition among employers to attract better qualified workers.

insert Table 3.362 here

Overall Training Needs for Existing Employers

Table 4.362 shows that employers emphasize the training and retraining of electrical and electronic engineers. Electrical and electronic technicians, and electrical and electronic assemblers were also mentioned frequently as needing training. The need for training of electrical and electronic engineers, technicians, and assemblers reflects the dynamism of electronic technology and its relevance to the industry. The use of electronic solid state control devices is expanding as prices decline and capabilities continue to increase [U.S. Department of Commerce, 1987].

TABLE 2.362

Electrical Industrial Apparatus - SIC 362

Employers Difficulty in Hiring Qualified People

	% of Employers with Difficulty		
Occupation	All	% Rural	% Urban
Coil Winders, Tapers, and Finishers	10.0%	0.0%	33.3%
Electric and Electronic Assemblers	20.0%	28.6%	0.0%
Electric and Electronic Engineers	30.0%	42.9%	0.0%
Inspectors, Testers, and Graders	10.0%	0.0%	33.3%
Lathe Turning Machine Setter or Operator	20.0%	14.3%	33.3%
Electromechanical Equip. Assembler	10.0%	14.3%	0.0%
Drafters	0.0	0.0%	0.0%
Electric and Electronic Technician	20.0%	28.6%	0.0%
Machine Assemblers	0.0	0.0%	0.0%
All Other Secretaries	10.0%	14.3%	0.0%
Total No. of Employers	10	7	3

* All is the percentage of employers with difficulty in hiring. Rural and urban are percentages of rural and urban employers with difficulty in hiring.

TABLE 3.362

Electrical Industrial Apparatus - SIC 362

Employers Responses to Difficulty in Hiring Qualified Personnel

(n - 10)

	Percent of Employers Using*								
Occupation	Promotion	Overtime	Job Redesign	Transfer	Expand Training	Raise Wages	Delay Expansion	Other	No Problem
Coil Winders, Tapers, and Finishers	18.2%	0.0%	0.0%	0.0%	9.1%	0.0%	0.0%	0.0%	54.5%
Electrical and Electronic Assemblers	9.1%	9.1%	0.0%	0.0%	9.1%	0.0%	0.0%	0.0%	63.6%
Electrical and Electronic Engineers	0.0%	0.0%	0.0%	9.1%	0.0%	9.1%	18.2%	0.0%	63.6%
Inspectors, Testers, and Graders	36.4%	9.1%	0.0%	9.1%	9.1%	0.0%	0.0%	0.0%	54.5%
Lathe Turning Machine Setter or Operator	18.2%	9.1%	0.0%	0.0%	18.2%	0.0%	9.1%	0.0%	54.5%
Electromechanical Equip. Assembler	0.0%	9.1%	0.0%	0.0%	9.1%	0.0%	0.0%	0.0%	54.5%
Drafters	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	72.7%
Electrical and Electronic Technicians	9.1%	9.1%	0.0%	0.0%	9.1%	9.1%	0.0%	0.0%	63.6%
Machine Assemblers	0.0%	0.0%	0.0%	0.0%	0.0%	9.1%	0.0%	0.0%	63.6%
All Other Secretaries	9.1%	0.0%	9.1%	0.0%	0.0%	0.0%	0.0%	0.0%	72.7%

The pattern of training needs for most occupations, when more than one firm responded, suggests greater need by rural employers. The need for training drafters was the only exception and was relatively higher in urban than rural locations.

insert Table 4.362 here

The need for training current employees is relatively greater in large firms (employment > 100) than in smaller firms in all occupations.

insert Table 5.362 here

Employers Training Method Preferences

Table 6.362 indicates that for all occupations employers hold a strong preference for on-the job training over other forms of training. Employers preference for on-the-job training ranges from 50 percent for coil winders, tapers, and finishers to 100 percent for inspectors, testers, and graders.

Employers preferred formal in-house over outside training for most occupations. Lathe operators, drafters, and secretaries were the exceptions. Employers generally preferred own to customized formal in-house training except for electrical and electronic engineers and secretaries. This preference indicates employers desire to train workers involved in standard operations with their own trainers, but workers whose jobs involves broader knowledge to be trained by outside trainers.

Similarly, employers prefer outside training organized by equipment suppliers to outside training by other outside sources only for electrical and electronic assemblers. Employers, however, prefer training by outside sources other than equipment suppliers for lathe, turning machine setters and operators, drafters, electrical and electronic technicians, and secretaries. Hence, the industry expects suppliers to train the production workers who are directly involved in the assembly of the components supplied to the firm, but other formal training for non-assembly occupations.

insert Table 6.362 here

TABLE 4.362

Electrical Industrial Apparatus - SIC 362

Employers' Beliefs That Current Employees Need Training by Location

	Total*	% Rural*	% Urban*
Coil Winders, Tapers, and Finishers	10.0%	0.0%	33.3%
Electrical and Electronic Assemblers	40.0%	42.9	33.3%
Electrical and Electronic Engineers	60.0%	57.1	66.6%
Inspectors, Testers, and Graders	30.0%	28.6	33.3%
Lathe Turning Machine Setter or Operator	10.0%	14.3	0.0
Electromechanical Equip. Assembler	20.0%	14.3	33.3%
Drafters	30.0%	14.3	66.6%
Electrical and Electronic Technician	40.0%	42.9	33.3%
Machine Assemblers	10.0%	14.3	0.0
All Other Secretaries	30.0%	42.9	33.3%
Total No. of Employers	10	7	3

* Percent of total, rural, or urban employers that believe that current employees need training.

TABLE 5.362

Electrical Industrial Apparatus - SIC 362

Employers Beliefs That Current Employees Need Training by Firm Size

(n = 10)

Occupation	All*	Firm Employment Size* < 25	Firm Employment Size* 26-100	Firm Employment Size* > 200
Coil Winders, Tapers, and Finishers	60%	50.0%	50.0%	100.0%
Electrical and Electronic Assemblers	100%	100.0%	75.0%	100.0%
Electrical and Electronic Engineer	100%	100.0%	75.0%	100.0%
Inspectors, Testers, and Graders	90%	75.0%	100.0%	100.0%
Lathe Turning Machine Setter or Operator	70%	75.0%	50.0%	100.0%
Electromechanical Equip. Assembler	70%	50.0%	75.0%	100.0%
Drafters	70%	50.0%	75.0%	100.0%
Electrical and Electronic Technician	70%	75.0%	50.0%	100.0%
Machine Assemblers	70%	75.0%	50.0%	100.0%
All Other Secretaries	100%	100.0%	100.0%	100.0%
Number of Firms in size category	10	4	4	2

* Proportion of all firms or firms of this size believing that current employees need training.

TABLE 6.362

Electrical Industrial Apparatus - SIC 362

Employers' Training Preferences*

(n = 10)

Occupation	Formal In-House Training		Formal Outside Training		On-the-Job Training
	Own	Customized	Supplier	Other	
Coil Winders, Tapers, and Finishers	20.0%	0.0%	0.0%	0.0%	50.0%
Electrical and Electronic Assemblers	30.0%	10.0%	10.0%	0.0%	80.0%
Electrical and Electronic Engineers	30.0%	40.0%	10.0%	10.0%	50.0%
Inspectors, Testers, and Graders	10.0%	0.0%	10.0%	10.0%	100.0%
Lathe Turning Machine Setter or Operator	0.0%	0.0%	0.0%	20.0%	80.0%
Electromechanical Equip. Assembler	10.0%	0.0%	0.0%	0.0%	60.0%
Drafters	0.0%	0.0%	10.0%	20.0%	60.0%
Electrical and Electronic Technician	20.0%	20.0%	10.0%	20.0%	70.0%
Machine Assemblers	20.0%	0.0%	0.0%	0.0%	60.0%
All Other Secretaries	0.0%	10.0%	0.0%	20.0%	70.0%

* Multiple responses permitted.

Occupational Preparation of Newly Hired Employees

Table 7.362 summarizes responses to a question about the occupational preparation of recently employed workers. Electrical and electronic engineers were most frequently given the highest occupational preparation rating. Sixty-three percent of respondents rated them as "very well prepared." They also received the highest average rating of 3.5 on a 4-point scale. Not one respondent gave them a "not well prepared" rating. Lathe turning machine setters and operators were most frequently cited as "not well prepared." They also received the lowest average rating. The higher rating for electrical and electronic engineers reflects the length of their training. The low preparation of lathe turning machine setters and operators reflects that most entry level lathe operators learn informally on the job by working as helpers to experienced lathe operators, though some acquire their skills through formal apprenticeship programs. The general lack of problems in hiring qualified workers (Table 2.362) is reflected in the general absence of "not well prepared" workers.

insert Table 7.362 here

Adoption of Technology and Its Implication on Skills and Training

Table 8.362 indicates no clear relationship between firm size and the adoption of technology. The technology adoption distribution of firms by employment size does not differ significantly from the size distribution of respondents. However, more firms in the rural areas have adopted solid state controls than firms in the urban areas (Table 9.362).

insert Table 8.362 here

insert Table 9.362 here

Most employers report that the introduction of new technology will not change basic skills. No employer reported a decline in basic skills for any of the occupations. Between 20 and 63 percent of the employers believe that the introduction of technology will increase the basic skill requirements of employees

TABLE 7.362

Electrical Industrial Apparatus - SIC 362

Occupational Preparation of New Hires

Occupation	No. of Employers Responding	Occupational Preparation Rating* % of responding with: 1-point	4-points	Average Rating
Coil Winders, Tapers, and Finishers	5	0.0%	0.0%	2.4
Electrical and Electronic Assemblers	10	0.0%	10.0%	2.4
Electrical and Electronic Engineer	8	0.0%	62.5%	3.5
Inspectors, Testers, and Graders	8	12.5%	12.5%	2.4
Lathe Turning Machine Setter or Operator	6	16.7%	0.0%	2.2
Electromechanical Equip. Assembler	5	0.0%	20.0%	2.4
Drafters	5	0.0%	20.0%	3.0
Electrical and Electronic Technician	7	0.0%	0.0%	2.4
Machine Assemblers	5	0.0%	0.0%	2.2
All Other Secretaries	10	0.0%	10.0%	2.9

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* Rating is based on a 4-point scale.
4 - very well prepared.
1 - not well prepared.

TABLE 8.362

Electrical Industrial Apparatus - SIC 362

Firm Size and Adoption of Technology

Size of Firm	% of Firms Adopting Technology Solid State Controls
< 25	20%
25-100	60%
> 100	20%
Total	5*

* Total number of firms adopting technology.

TABLE 9.362

Electrical Industrial Apparatus - SIC 362

Firm Location and Adoption of Technology

Location of Firm	% of Firms Adopting Technology Solid State Controls
Rural	80%
Urban	20
Total	5*

* Total number of firms adopting technology.

in all occupations except coil winders, tapers and finishers, and machine assemblers. The tendency is for basic skill requirements to increase rather than decrease for occupations in the electrical industrial apparatus industry. Consequently, there is the need for improving basic skills.

insert Table 10.362 here

Table 11.362 similarly indicates that the introduction of technology will increase the technical skills required in all occupations. A relatively greater proportion of employers believed that technical skill requirements will increase for electrical and electronic engineers and technicians reflecting the importance of electronics in the technological advancement of the industry.

insert Table 11.362 here

Employers response to the importance of training in adapting employees to technological change is reported in Table 12.362. Electrical and electronic engineers followed by electrical and electronic assemblers were the most frequently cited occupations in which employers considered added training as "very important." Machine assemblers, and lathe, turning machine setters and operators require the least training in adapting to technological change.

insert Table 12.362 here

Summary

Main findings in the electrical industrial apparatus industry are as follows:

1. Employment growth between 1987 and 1988 in all occupations will continue in 1989 except for drafters where no employment growth is expected. Employment growth is higher in blue-collar jobs than in technical positions suggesting shifts of employment from technical jobs to blue-collar jobs.

TABLE 10.362

Electrical Industrial Apparatus - SIC 362

Adoption of Technology and Changes in Basic Skills

Occupation	No. of Employers Responding	% of Employers Reporting Changes in Basic Skills		
		Increase	No Change	Decrease
Coil Winders, Tapers, and Finishers	4	0.0%	100.0%	0.0%
Electrical and Electronic Assemblers	8	50.0%	50.0%	0.0%
Electrical and Electronic Engineers	8	62.5%	37.5%	0.0%
Inspectors, Testers, and Graders	7	42.9%	57.1%	0.0%
Lathe Turning Machine Setter or Operator	5	20.0%	80.0%	0.0%
Electromechanical Equip. Assembler	5	20.0%	80.0%	0.0%
Drafters	6	50.0%	50.0%	0.0%
Electrical and Electronic Technician	6	50.0%	50.0%	0.0%
Machine Assemblers	5	0.0%	100.0%	0.0%
All Other Secretaries	8	50.0%	50.0%	0.0%

TABLE 11.362

Electrical Industrial Apparatus - SIC 362

Adoption of Technology and Changes in Technical Skills

Occupation	No. of Employers Responding	% of Employers Reporting Changes in Technical Skills		
		Increase	No Change	Decrease
Coil Winders, Tapers, and Finishers	4	25.0%	75.0%	0.0%
Electrical and Electronic Assemblers	8	50.0%	50.0%	0.0%
Electrical and Electronic Engineers	8	75.0%	25.0%	0.0%
Inspectors, Testers, and Graders	7	28.6%	71.4%	0.0%
Lathe Turning Machine Setter or Operator	5	20.0%	80.0%	0.0%
Electromechanical Equip. Assembler	5	20.0%	80.0%	0.0%
Drafters	6	50.0%	50.0%	0.0%
Electrical and Electronic Technician	6	66.7%	33.3%	0.0%
Machine Assemblers	5	20.0%	80.0%	0.0%
All Other Secretaries	8	25.0%	75.0%	0.0%

TABLE 12.362

Electrical Industrial Apparatus - SIC 362

The Importance of Training and Retraining in Adopting Employees to Technological Change

Occupation	Importance of Training* (4)	(3)	(2)	(1)	Average Importance
Coil Winders, Tapers, and Finishers	25.0%	25.0%	25.0%	25.0%	2.5
Electrical and Electronic Assemblers	42.9%	14.3%	28.6%	14.3%	2.9
Electrical and Electronic Engineers	47.1%	14.3%	14.3%	14.3%	3.1
Inspectors, Testers, and Graders	28.6%	28.6%	28.6%	14.3%	2.7
Lathe Turning Machine Setter or Operator	0.0%	20.0%	40.0%	40.0%	1.8
Electromechanical Equip. Assembler	16.7%	33.3%	16.7%	33.3%	2.3
Drafters	16.7%	33.3%	33.3%	16.7%	2.5
Electrical and Electronic Technician	28.6%	42.9%	14.3%	14.3%	2.9
Machine Assemblers	0.0%	40.0%	20.0%	40.0%	2.0
All Other Secretaries	14.3%	14.3%	42.9%	28.6%	2.1

* Importance graded on a scale of 1 (not very important) to 4 (very important).

2. Training is needed for all employees even though employers expressed greater training need for electrical and electronic engineers and technicians.
3. Employers prefer on-the-job training in all occupations to other forms of training. Generally employers prefer own in-house training for workers involved in routinized operations while preference is for training organized by outside trainers for jobs that require broader skills.
4. Newly hired electrical and electronic engineers are the most prepared workers among the occupations surveyed. Lathe, turning machine setters and operators are the least prepared.
5. There is no clear relationship between firm size and the adoption of technology.
6. The introduction of technology will increase both the basic and technical skill requirements of workers in almost all occupations.

The conclusion is that even though employers are more concerned about training needs of technical occupations, training of blue collar workers should not be overlooked since the blue-collar workers remain critical to the industry's operations.

CHAPTER 12

COMMUNICATIONS EQUIPMENT INDUSTRY - SIC 366

This sector includes establishments primarily engaged in the manufacture of wire telephone and telegraph equipment, radio and television broadcasting equipment, and other communication and related equipment. The major products of the sector include modems, telephone and telegraph communications interface equipment, closed-circuit and cable television equipment, transmitters, transceivers and receivers, communication antennas, traffic signalling equipment, and fire and burglar alarm apparatus.

The communications equipment industry is among the 26 high technology industries in the state [DIHLR, 1987]. The industry employed 3,510 workers in 1985 and it is projected to employ 3,810 by 1995 representing an employment change of 9.2 percent which exceeds the 5.8 percent change expected in manufacturing as a whole.

Employment Growth and Difficulty in Hiring Qualified Personnel

Employment changes for selected occupations in the nine firms responding is presented in Table 1.366. Employment declined between 1987 and 1988 in six out of the nine occupations surveyed. In two occupations employment did not change while employment increased for electromechanical equipment assemblers and secretaries. The 1987-88 shift of employment from electrical and electronic assemblers, inspectors, testers and graders, and electrical and electronic technicians is noteworthy. However, the expected increases in employment in 1989 for most of these occupations suggests a cyclical rather than a structural trend in occupational shifts. For instance, employers expect employment increases in most occupations in 1989.

insert Table 1.366 here

Table 2.366 indicates that employers have had little difficulty in hiring qualified employees. Only one employer reported difficulty in filling available positions for electrical and electronic assemblers, and electrical and electronic technicians. For the remaining occupations no employer reported any difficulty.

TABLE 1.366

Communications Equipment Industry - SIC 366

Employment Growth By Occupation

(n = 9)

Occupation	Employment 1987	Employment 1988	Employment Change 1987-1988 #	Employment Change 1987-1988 %	Expected Change 1989*
Electrical and Electronic Assemblers	868	849	-19	-2.19%	+
Inspectors, Testers, and Graders	194	187	-7	-3.61%	-
Electrical and Electronic Technician	226	219	-7	-3.10%	+
Tool and Die Makers	21	20	-1	-4.76%	+
Combination Machine Tool Setter or Operator	2	3	1	50.00%	+
Electromechanical Equip. Assembler	82	100	18	21.95%	+
Lathe Turning Machine Setter or Operator	16	16	0	0.00%	0
General Office Clerks	34	34	0	0.00%	0
All Secretaries	73	83	10	13.70%	+
Total	1516	1511	-5	-0.33%	

* + means expected increase in employment
0 means no change in employment is expected
- means expected decrease in employment

Given the general decline in employment levels, the lack of difficulty in hiring qualified people does not necessarily indicate an adequate supply if expansion occurred, but it does suggest a pool of recently "laid off" qualified workers.

insert Table 2.366 here

Table 3.366 confirms the absence of much difficulty in hiring qualified people to fill the available positions. In all occupations, over 77 percent of employers surveyed said they had no problem in hiring qualified personnel. Again the general stability for these occupations cautions an interpretation of what supply really is.

insert Table 3.366 here

Overall Training Needs for Existing Employees

According to Table 4.366, none of the employers indicated the need for training current employees in five occupations. In the remaining four occupations only one employer indicated a need for training of current employees. The absence of the need for educating current employees reflects the avalability of qualified workers and a natural reluctance of firms with stable or declining employment to invest in training.

insert Table 4.366 here

Only one firm, rural location with less than 25 employees, responded to the question on the need for training current employees. Therefore, no results are reported.

Employers Training Methods Preferences

According to Table 6.366, most employers prefer on the job training of current employees. Formal in-house training by the firms' own trainers is the second most popular training preference of employers.

TABLE 2.366

Communications Equipment Industry - SIC 366

Employers Difficulty in Hiring Qualified People

	% of Employers with Difficulty*		
Occupation	All*	% Rural	% Urban
Electrical and Electronic Assemblers	11.1%	14.3%	0.0%
Inspectors, Testers, and Graders	0.0%	0.0%	0.0%
Electrical and Electronic Technician	11.1%	14.3%	0.0%
Tool and Die Makers	0.0%	0.0%	0.0%
Combination Machine Tool Setter or Operator	0.0%	0.0%	0.0%
Electromechanical Equip. Assembler	0.0%	0.0%	0.0%
Lathe Turning Machine Setter or Operator	0.0%	0.0%	0.0%
General Office Clerks	0.0%	0.0%	0.0%
All Secretaries	0.0%	0.0%	0.0%
Total No. of employers	9	7	2

* All is the percentage of employers with difficulty in hiring. Rural and urban are percentages of rural and urban employers with difficulty in hiring.

TABLE 3.366

Communications Equipment Industry - SIC 366

Employers Responses to Difficulty in Hiring Qualified Personnel

(n - 9)

	Percent of Employers Using*								
Occupation	Promotion	Overtime	Job Redesign	Transfer	Expand Training	Raise Wages	Delay Expansion	Other	No Problem
Electrical and Electronic Assemblers	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0	100.0
Inspectors, Testers, and Graders	0.0%	0.0%	0.0%	11.1%	0.0%	0.0%	0.0%	0.0	88.4
Electrical and Electronic Technician	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0	10.0
Tool and Die Makers	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0	77.8
Combination Machine Tool Setter or Operator	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0	77.8
Electromechanical Equip. Assembler	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0	100.0
Lathe Turning Machine Setter or Operator	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0	100.0
General Office Clerks	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0	88.9
All Secretaries	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0	88.9

* Multiple responses permitted.

TABLE 4.366

Communications Equipment Industry - SIC 366

Employers Belief That Current Employees Need Training by Location

Occupation	Total*	% Rural*	% Urban*
Electrical and Electronic Assemblers	11.1%	14.3%	0.0%
Inspectors, Testers and Graders	0.0%	0.0%	0.0%
Electrical and Electronic Technician	11.1%	0.0%	50.0%
Tool and Die Makers	0.0%	0.0%	0.0%
Combination Machine Tool Setter or Operator	0.0%	0.0%	0.0%
Electromechanical Equip. Assembler	0.0%	0.0%	0.0%
Lathe Turning Machine Setter or Operator	0.0%	0.0%	0.0%
General Office Clerks	11.1%	14.3%	0.0%
All Secretaries	11.1%	14.3%	0.0%
Total No. of Employers	9	7	2

* Percent of total, rural, or urban employers that believe that current employees need training.

insert Table 6.366 here

Occupational Preparation of Newly Hired Employees

Table 7.366 shows that for all occupations, a substantial proportion of employers think new entrants are not well prepared. Between 33 and 100 percent of employers reported low occupational preparation for new hires. Only one employer reported workers were "well prepared" and that was for general office clerks which also received the highest average rating of 2.7 on the 4-point scale. Tool and die makers, and combination machine tool setter or operator received the lowest average rating, but only one employer responded to the occupational preparation question about those two occupations.

The reported low preparation of newly hired workers is surprising considering the minimal difficulty in hiring qualified workers (Table 2.366) plus the availability of laid off workers (Table 1.366). This finding suggests that employers hire people with minimal qualification and train them on the job (Table 6.366).

insert Table 7.366 here

Adoption of Technology and Its Implication on Skills and Training

Only one firm has introduced fiber optics technology. This firm is large (more than 200 employees) and is located in an urban area. Since there was only one response no meaningful judgement can be made about the relationship between employment size or location and technology adoption.

All of the employers responding think that the introduction of new technology will not affect the basic skill requirements of workers for any of the occupations examined. Since only one employer has recently introduced new technology, the responses about the effect of technology on basic skills reflects opinions of employers rather than what would actually happen. It may also indicate employers experience with technologies that they have introduced in the past. Regardless, the responses imply the introduction of new technologies will not decrease the basic skill requirements of workers.

Table 11.366 shows that in five occupations, employers believe the technical skills required by workers will increase with the introduction of new technologies. In the remaining occupations technical skills did not change with the introduction of new technologies. Table 11.366 also indicates that the technical skill

TABLE 6.366

Communications Equipment Industry - SIC 366

Employers Training Preferences*

(n = 9)

Occupation	Formal In-House Training Own	Formal In-House Training Customized	Formal Outside Training Supplier	Formal Outside Training Other	On-the-Job Training
Electrical and Electronic Assemblers	11.1%	11.1%	11.1%	0.0%	44.4%
Inspectors, Testers and Graders	11.1%	0.0%	0.0%	0.0%	55.6%
Electrical and Electronic Technician	22.2%	11.1%	11.1%	0.0%	55.6%
Tool and Die Makers	11.1%	0.0%	0.0%	0.0%	33.3%
Combination Machine Tool Setter or Operator	11.1%	0.0%	0.0%	0.0%	22.2%
Electromechanical Equip. Assembler	11.1%	0.0%	0.0%	0.0%	55.6%
Lathe Turning Machine Setter or Operator	11.1%	0.0%	11.1%	0.0%	44.4%
General Office Clerks	11.1%	0.0%	0.0%	0.0%	33.3%
All Secretaries	11.1%	0.0%	0.0%	0.0%	55.6%

* Multiple responses permitted.

TABLE 7.366

Communications Equipment Industry - SIC 366

Occupational Preparation of Employees

Occupation	No. of Employers Responding	Occupational Preparation Rating* % of responding with:		Average Rating
		1-point	4-points	
Electrical and Electronic Assemblers	6	50.0%	0.0%	2.0
Inspectors, Testers and Graders	4	50.0%	0.0%	2.0
Electrical and Electronic Technician	6	33.3%	0.0%	2.0
Tool and Die Makers	1	100.0%	0.0%	1.0
Combination Machine Tool Setter or Operator	1	100.0%	0.0%	1.0
Electromechanical Equip. Assembler	5	40.0%	0.0%	2.2
Lathe Turning Machine Setter or Operator	3	66.7%	0.0%	1.7
General Office Clerks	3	33.3%	33.3%	2.7
All Secretaries	3	66.7%	0.0%	1.3

* Rating is based on a 4-point scale.
4 = very well prepared.
1 = not well prepared.

requirements increased for most production workers. Technical skills of technology-oriented occupations such as electrical and electronic techncians increased and at the same time technical skills of less-technology oriented occupations such as assemblers also increased. Hence, the effect of introduction of technology on technical skills is not confined to the technology-oriented occupations.

insert Table 11.366 here

Table 12.366 contains a summary of employers' responses to the importance of training in adapting to technological change. Electrical and electronic technicians were the most frequently cited occupation that employers considered training as "very important " in adapting employees to technical change. Combination machine tool setters or operators, and general office clerks require the least training in technical change adaptation. The importance of training in adapting electrical and electronic technicians to technical change reflects the importance of the occupation to the emerging technologies in the communications equipment industry.

insert Table 12.366 here

Summary

The main findings in the communications equipment industry are as follows:

1. Employment declined in most occupations in the communications equipment industry between 1987 and 1988. However, employers expect the 1989 level of employment to increase. Hence, the employment decline in most occupations in 1988 does not indicate a structural shift of employment across occupations in the industry.
2. Employers do have little difficulty in finding qualified personnel to fill available positions, but this may be due to the general lack of employment growth.
3. In all occupations, employers reported that new hires were not well prepared for the jobs they take even though they have minimal difficulty in finding "qualified workers." This suggests that most workers are trained on-the-job.

TABLE 11.366

Communications Equipment Industry - SIC 366

Adoption of Technology and Changes in Technical Skills

Occupation	No. of Employers Responding	% of Employers Reporting Changes in Technical Skills		
		Increase	No Change	Decrease
Electrical and Electronic Assemblers	3	33.3%	66.7%	0.0%
Inspectors, Testers and Graders	3	0.0%	100.0%	0.0%
Electrical and Electronic Technician	4	50.0%	50.0%	0.0%
Tool and Die Makers	2	50.0%	50.0%	0.0%
Combination Machine Tool Setter or Operator	2	0.0%	100.0%	0.0%
Electromechanical Equip. Assembler	3	33.3%	66.7%	0.0%
Lathe Turning Machine Setter or Operator	3	33.3%	66.7%	0.0%
General Office Clerks	2	0.0%	100.0%	0.0%
All Secretaries	3	0.0%	100.0%	0.0%

TABLE 12.366

Communications Equipment Industry - SIC 366

The Importance of Training and Retraining in Adopting Employees to Technological Change

	Importance of Training*				
Occupation	(4)*	(3)	(2)	(1)	Average Importance
Electrical and Electronic Assemblers	0.0%	33.3%	33.3%	33.3%	2.0
Inspectors, Testers and Graders	0.0%	66.7%	0.0%	33.3%	2.3
Electrical and Electronic Technician	66.7%	33.3%	0.0%	0.0%	3.7
Tool and Die Makers	0.0%	0.0%	100.0%	0.0%	2.0
Combination Machine Tool Setter or Operator	0.0%	0.0%	0.0%	100.0%	1.0
Electromechanical Equip. Assembler	0.0%	66.7%	0.0%	33.3%	2.3
Lathe Turning Machine Setter or Operator	0.0%	66.7%	0.0%	33.3%	2.3
General Office Clerks	0.0%	0.0%	0.0%	100.0%	1.0
All Secretaries	0.0%	0.0%	33.3%	66.7%	1.3

* Importance graded on a scale of 1 (not very important) to 4 (very important).

4. There were not enough responses to make a judgement about the relationship between employment size or location of firms and the introduction of technologies.

5. Employers in the communication equipment industry indicated that the introduction of technology has no effect on the basic skill requirements of workers though the technical skills of workers in most occupations increase.

The conclusion is that training is not a major concern of employers in this industry since enough people are available with minimal qualification who are able to learn on-the-job.

CHAPTER 13

ENGINEERING SCIENTIFIC AND RESEARCH INSTRUMENTS INDUSTRY - SIC 381

This sector consists of establishments primarily engaged in the manufacture of laboratory equipment and aircraft instrumentation. Major products of the industry include balances and furnaces; radar systems and equipment; sonar systems and equipment; navigation systems and equipment; countermeasures equipment; aircraft and missile control equipment; flight and navigation sensors, transmitters, and displays; gyroscopes; airframe equipment instruments; and speed, pitch, and roll navigational instruments and systems.

The engineering scientific and research instrument industry is one of the 26 high technology industries in Wisconsin [DILHR, 1987]. The industry employed 2,810 workers in 1985 and is projected to increase to 3,270 by 1995, a 16.3 percent change in employment. The projected growth is the fifth highest among the high technology industries in the state.

Employment Growth and Difficulty in Hiring Qualified Personnel

Employment distribution for selected occupations in the five respondents is presented in Table 1.381. The Table shows that employment increased moderately in most occupations between 1987 and 1988. There was a slight decline in the number of jobs for drafters while employment for machine feeders and offbearers, computer programmers, and electrical and electronic engineers did not change. Sales representatives registered the highest number of new jobs. Except for drafters, employers expect more new jobs in all occupations in 1989.

insert Table 1.381 here

Table 2.381 shows that except for sales representatives employers do not have much difficulty in hiring qualified people. The relatively minimal difficulty in finding qualified people to fill positions reflects more that firms were not vigorously hiring (Table 1.381) than a surplus of qualified workers.

TABLE 1.381

Engineering & Laboratory Research Instruments - SIC 381

Employment Growth By Occupation

(n = 5)

Occupation	Employment 1987	Employment 1988	Employment Change 1987 - 1988 #	Employment Change 1987 - 1988 %	Expected Change 1989*
Precision Instrument Repairers	8	10	2	25.0%	+
Electrical and Electronic Technicians	9	10	1	11.1%	+
Sales Representatives	21	27	6	28.6%	+
Machine Feeders and Offbearers	48	48	0	0.0%	+
Electrical and Electronic Assembler	30	35	5	16.7%	+
Drafters	6	5	-1	-16.7%	0
Computer Programmers	6	6	0	0.0%	+
Electrical and Electronic Engineer	5	5	0	0.0%	+
Bookkeeping and Accounting Clerks	10	12	2	20.0%	+
Total	143	158	15	10%	

* + Means expected increase in employment.
0 Means no change in employment expected.
- Means expected decrease in employment.

insert Table 2.381 here

Table 3.381 summarizes employers strategies in resolving difficulty in hiring qualified workers. The Table reinforces earlier information that for almost all of the occupations there has been minimal difficulty in hiring qualified personnel. For most occupations, 60 percent of employers said they had no problem filling available positions. When difficulties did occur, the strategy used most frequently by employers was promotion, but that was only for electrical and electronic technicians. About 20 percent of employers used training expansion, wage increases, overtime and expansion delay. The Table generally supports the findings from Table 2.381 that there is relatively little difficulty in hiring workers to fill vacancies that become available.

insert Table 3.381

Overall Training Needs for Existing Employees

Table 4.381 indicates that electrical and electronic technicians, and sales representatives were the most frequently cited as needing training. The low number of responses does not permit any reasonable judgement about the rural and urban pattern of training needs distribution.

The need for training electrical and electronic technicians reflects the importance of electronics in the industry's operations as well as the changing and new technologies which require additional skills. The need for training of sales representative reflects the keen international competition especially from Japanese and Pacific Rim producers. Sales representatives training must involve marketing of products in the U.S. as well as the international market. For some products, like laboratory equipment, recent U.S. sales have been weak [U.S. Department of Commerce, 1987]. Moreover, while exports declined imports expanded, further depressing total sales of U.S. manufactures. Thus, more well trained sales representatives are needed to compete in the U.S. market to maintain domestic market shares and the growing international market.

insert Table 4.381 here

TABLE 2.381

Engineering & Laboratory Research Instruments - SIC 381

Employers Difficulty in Hiring Qualified People

	% of Employers with Difficulty*		
Occupation	All*	% Rural	% Urban
Precision Instrument Repairers	20.0%	0.0%	50.0%
Electrical and Electronic Technicians	0.0%	0.0%	0.0%
Sales Representatives	60.0%	33.3%	100.0%
Machine Feeders and Offbearers	0.0%	0.0%	0.0%
Electrical and Electronic Assemblers	20.0%	0.0%	50.0%
Drafters	0.0%	0.0%	0.0%
Computer Programmers	0.0%	0.0%	0.0%
Electrical and Electronic Engineer	0.0%	0.0%	0.0%
Bookkeeping and Accounting Clerks	0.0%	0.0%	0.0%
Total no. of employers	5	3	2

* All is the percentage of employers with difficulty in hiring. Rural and urban are percentages of rural and urban employers with difficulty in hiring.

TABLE 3.381

Engineering & Laboratory Research Instruments - SIC 381

Employers Responses to Difficulty in Hiring Qualified Personnel

(n - 5)

	Percent of Employers Using*								
Occupation	Promotion	Overtime	Job Redesign	Transfer	Expand Training	Raise Wages	Delay Expansion	Other	No Problem
Precision Instrument Repairers	0.0%	0.0%	0.0%	0.0%	20.0%	0.0%	0.0%	0.0%	60.0%
Electrical and Electronic Technicians	40.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	60.0%
Sales Representatives	0.0%	0.0%	0.0%	0.0%	20.0%	20.0	20.0%	0.0%	40.0%
Machine Feeders and Offbearers	0.0%	20.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	60.0%
Electrical and Electronic Assembler	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	20.0%	40.0%
Drafters	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	60.0%
Computer Programmers	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	60.0%
Electrical and Electronic Engineer	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	60.0%
Bookkeeping and Accounting Clerks	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	60.0%

* Multiple responses permitted.

TABLE 4.381

Engineering & Laboratory Research Instruments - SIC 381

Employers Beliefs That Current Employees Need Training by Location

Occupation	Total*	% Rural*	% Urban*
Precision Instrument Repairers	20.0%	0.0%	50.0%
Electrical and Electronic Technicians	40.0%	33.3%	50.0%
Sales Representatives	40.0%	33.3%	50.0%
Machine Feeders and Offbearers	0.0%	0.0%	0.0%
Electrical and Electronic Assembler	0.0%	0.0%	0.0%
Drafters	0.0%	0.0%	0.0%
Computer Programmers	20.0%	33.3%	0.0%
Electrical and Electronic Engineer	20.0%	33.3%	0.0%
Bookkeeping and Accounting Clerks	20.0%	33.3%	0.0%
Total No. of Employers	5	3	2

* Percent of total, rural, or urban employers that believe that current employees need training.

Table 5.381 indicates that need for extra training was expressed more by smaller firms (less than 25 employees) than larger firms. This may suggest that in order to remain competitive smaller firms (which are more likely to feel the effect of foreign competition) will have to more continually update employees than will larger firms.

insert Table 5.381 here

Employers Training Method Preferences

Table 6.381 shows that employers indicated preferences for on-the-job training for more occupations than they did for other types of training. Formal outside training was the least preferred type of training among the occupations surveyed.

Variation also exists across occupations regarding preferred types of formal training. For instance, employers showed preference for formal own in-house training over customized training of electrical and electronic technicians and bookkeeping and accounting clerks, while customized training is preferred in the training of sales representatives and computer programmers. The preference of customized training for sales representative reflects the outside orientation of their work which require training that may be better provided by experts in sales more likely to be found outside the firm. Similarly, the preference for customized training of computer programmers also reflects the rapid changes in computer technology which requires input from outside trainers who are more knowledgeable about the state-of-the -art technology.

Formal outside training by equipment suppliers is also preferred over formal outside training by organizations like technical colleges for precision instrument repairers. On the other hand, employers prefer training of bookkeeping and accounting clerks and computer programmers by technical colleges rather than by suppliers. The preference of supplier training for precision instrument repairers over other outside trainers is obvious. The preference of other trainers for computers programmers reflects the changing computer languages and softwares that require training facilities with more varied expertise than suppliers.

insert Table 6.381 here

TABLE 5.381

Engineering & Laboratory Research Instruments - SIC 381

Employers Beliefs That Current Employees Need Training By Firm Size

		Firm Employment Size*		
Occupation	All Employers*	< 25	26-90	> 90
Precision Instrument Repairers	20.0%	50.0%	0.0%	0.0%
Electrical and Electronic Technicians	40.0%	100.0%	0.0%	0.0%
Sales Representatives	40.0%	100.0%	0.0%	0.0%
Machine Feeders and Offbearers	0.0%	0.0%	0.0%	0.0%
Electrical and Electronic Assemblers	0.0%	0.0%	0.0%	0.0%
Drafters	0.0%	0.0%	0.0%	0.0%
Computer Programmers	20.1%	50.0%	0.0%	0.0%
Electrical and Electronic Engineers	0.0%	0.0%	0.0%	0.0%
Bookkeeping and Accounting Clerks	20.1%	50.0%	0.0%	0.0%
Number of Firms in Size Category	5	2	2	1

* Proportion of all firms or firms of this size believing that current employees need training.

TABLE 6.381

Engineering & Laboratory Research Instruments - SIC 381

Employers Training Preferences*
(n = 5)

Occupation	Formal In-House Training		Formal Outside Training		On-the-Job Training
	Own	Customized	Supplier	Other	
Precision Instrument Repairers	20.0%	20.0%	20.0%	0.0%	20.0%
Electrical and Electronic Technicians	20.0%	0.0%	0.0%	0.0%	0.0%
Sales Representatives	20.0%	40.0%	20.0%	20.0%	40.0%
Machine Feeders and Offbearers	0.0%	0.0%	0.0%	0.0%	40.0%
Electrical and Electronic Assemblers	0.0%	0.0%	0.0%	0.0%	20.0%
Drafters	0.0%	0.0%	0.0%	0.0%	20.0%
Computer Programmers	0.0%	20.0%	0.0%	20.0%	0.0%
Electrical and Electronic Engineers	0.0%	0.0%	0.0%	0.0%	0.0%
Bookkeeping and Acctng. Clerks	20.0%	0.0%	0.0%	40.0%	20.0%

* Multiple responses permitted.

Occupational Preparation of Newly Hired Employees

Drafters were the most frequently given the highest occupational preparation rating (Table 7.381). Half of the employers rated them as "very well prepared." However, electrical and electronic technicians scored the highest average rating of 3.5 on a 4-point scale. Machine feeders and offbearers, which are usually entry level jobs that do not require prior training, were the most frequently cited as "not well prepared" and also received the lowest average rating.

insert Table 7.381 here

Adoption of Technology and Its Implication on Skills and Training

The small number of respondents who replied to the question regarding technology introduced does not permit judgement about the characteristics of firms that are more likely to introduce new technology. To the extent that the four observations permit any inferences, the data suggest that technology introduction does not vary across firm size (Table 8.381).

insert Table 8.381 here

Similarly, data on the rural urban distribution of introduction of technology does not permit any inferences.

insert Table 9.381 here

Only one employer responded to the question on whether introduction of technology will affect the basic and technical skills of workers. Generally the responses indicated that skill requirements will increase but the smallness of responses does not permit generalization.

Only one firm responded to the question about the importance of training in adapting to technical change. This precludes any meaningful judgement.

TABLE 7.381

Engineering & Laboratory Research Instruments - SIC 381

Occupational Preparation of New Hires

Occupation	No. of Employers Responding	Occupational Preparation Rating* % of responding with 1-point	4-points	Average Rating
Precision Instrument Repairers	2	33.3%	33.3%	2.7
Electrical and Electronic Technicians	2	0.0%	33.3%	3.5
Sales Representatives	5	0.0%	0.0%	2.0
Machine Feeders and Offbearers	2	50.0%	0.0%	1.5
Electrical and Electronic Assemblers	3	33.3%	0.0%	2.0
Drafters	2	0.0%	50.0%	3.0
Computer Programmers	3	0.0%	33.3%	3.3
Electrical and Electronic Engineers	1	0.0%	0.0%	3.0
Bookkeeping and Accounting Clerks	4	0.0%	0.0%	2.5

* Rating is based on a 4-point scale.
4 - very well prepared.
1 - not well prepared.

TABLE 8.381

Engineering & Laboratory Research Instruments - SIC 381

Firm Size and Adoption of Technology

	% of Firms Adopting Technology		
Firm Employment Size	CCCF**	FOT**	ISP**
< 25	0.0%	100.0%	50.0%
26-90	100.0%	0.0%	50.0
> 90	0.0%	0.0%	0.0%
Total	1*	1*	2*

* Total Number of firms adopting technology.
** CCCF is Capillary Columns for Super Critical Fluids
FOT is Fiber Optics
ISP is Integrated Sample Preparation and Analytical Instruments

TABLE 9.381

Engineering & Laboratory Research Instruments - SIC 381

Firm location and Adoption of Technology

	% of Firms Adopting Technology		
Location	CCCF	FOT	ISP
Rural	0.0%	100.0%	50.0%
Urban	100.0%	0.0%	50.0%
Total	1*	1*	2*

CCCF is Capillary Columns for Super Critical Fluids
FOT is Fiber Optics
ISP is Integrated Sample Preparation and Analytical Instruments
* Total number of firms adopting technology.

Summary

1. Few new jobs were posted for most occupations in the engineering and laboratory instruments industry in 1988 with a slight decline in employment of drafters. It is expected that employment will increase in 1989.
2. In all occupations, except sales representatives, employers did not have difficulty in hiring qualified personnel to fill available positions. Difficulty in hiring sales representatives suggests a potential shortage of workers for the occupation. This may be the consequence of a shift in focus of sales from local to international competition.
3. Employers cited training needs in areas related to technology in the industry like electrical and electronic technicians as well as for sales related jobs. The need for training of sales representatives seem to confirm a potential imbalance between skills of available sales representatives and the skills needed for sales representative in a global competitive economy.
4. The type of training preferred depends on the occupation concerned. Outside training is preferred for occupations like sales representatives, while in-house training is preferred for occupations like electrical and electronic technicians.
5. Basic and technical skills are more likely to be upgraded with the introduction of new technologies implying some need to augment the depth of the basic and technical knowledge aspect of training.

The conclusion is that training is needed most in occupations which are critical for maintaining or expanding market share of firms. These occupations include technology oriented jobs like electrical and electronic technicians as well as sales related jobs like sales representatives.

CHAPTER 14

THE EXTENT EMPLOYERS USE OWN FORMAL IN-HOUSE TRAINING AND METHODS OF RECRUITMENT

This chapter reviews the extent employers are satisfied with their own formal in-house training facilities and summarizes the responses to the question about recruitment methods used by employers across all the sectors surveyed. Even though the discussion is across sectors, we acknowledge that the extent employers use own in-house training and the methods of recruitment used can vary across occupations.

The Extent of Employers Formal In-House Training Facilities

The questions about how much formal in-house training employers offer; whether they are satisfied with it or not; and whether they are considering outside facilities gives an indication of the extent firms provide formal training, and the potential for public vocational education involvement in private sector formal training.

Formal training has traditionally been performed by schools, colleges, and the vocational system. Yet, 28 percent of employers surveyed reported they had over 75 percent of their formal training done in-house. Including those who provide over half of their formal training internally means 52 percent of employers have more than half of their formal training done in-house by their own trainers. Table 13 shows that the level of satisfaction with their own in house training facilities is also high (63 percent).

insert Table 13 here

The high level of satisfaction is one reason employers are increasingly turning to internal formal training. This could be due to rapidly changing technology and/or dissatisfaction with external sources.

Rapidly changing technology may require not only "hands on experience", but acquisition of area-specific theoretic knowledge. Formal in-house training may be the best method to acquire such knowledge, because it can combine hands on experience with classroom review of more general concepts.

TABLE 13

EXTENT OF EMPLOYERS OWN FORMAL IN-HOUSE TRAINING

% of Formal Training By Own In-House Trainers	Own Formal In-House Training		
	% of Firms	% Satisfied	% Looking Elsewhere
Less than 25%	30.5%	39.3%	29.5%
25% - 50%	18.0%	72.2%	52.8%
51% - 65%	23.5%	82.9%	36.2%
Over 75%	28.0%	64.3%	21.4%
Total		62.5%	33%

TABLE 14

EMPLOYERS RECRUITMENT METHODS

Type of Recruitment Method	Frequency of Recruitment Methods			
	Very Frequent	Not Frequent	Frequent	Not At All
Community College Placement Office	3%	12%	27%	58%
Four Year College Placement Office	4%	16%	32%	48%
Technical College Placement Office	5%	25%	40%	30%
Wisconsin Job Service Office	8%	16%	35%	41%
Classified Advertisement	51%	26%	10%	12%
Job Postings in Firm's Office	33%	13%	17%	37%

Column 3 of Table 13 indicates that even though most firms are satisfied with their in-house training facilities, a third of them are willing to hire outside institutions to provide formal training of their workers. This includes those who are not satisfied with their own trainers and those who are satisfied but probably need extra assistance. For instance, among employers who offer between 51 and 75 percent of their formal training internally, 83 percent are satisfied. Yet, 36 percent are looking elsewhere. Assuming that the difference of 17 percent (i.e., between 100 percent and 83 percent) are those not satisfied, then the balance of 19 percent (i.e., 36 percent minus 17 percent) are those satisfied but still looking elsewhere.

The implication of the finding this large a proportion of employers with a large component of formal in-house training is that employers are increasingly aware of the importance of formal training of workers in addition to the training acquired in schools and colleges. In support of this view we quote two respondents' comments echoed by other respondents:

> "Before we worry about job training, let's teach them to spell, read and add. That would be a good start!!"
>
> "More and more I see our educational system failing to prepare it's graduates for the time they will take their place in the workforce. I am speaking of the deficiencies in basic skills; reading, writing, mathematics, logical thinking...I think the problem goes deeper than just training."

The message from these quote is that formal training in the traditional school system does not seem to deliver what employers believe is needed.

The high percentage of employers with formal training performed in-house also indicates that most employers are interested in formal training which they can exert some control. Such training may better prepare and orient the worker for their specific jobs. This further suggests that those not satisfied with their own training program and those seeking extra training are looking for customized training tailored to their specific needs as well as training that can make up for deficiencies in basic skills.

Recruitment Methods Used By Employers

The question on the type of recruitment methods used gives some insight into the extent employers contact schools and colleges in the recruitment process. It also probes the extent employers invest in their search for workers.

Two main dimensions of recruitment strategies used here are: intensive-search and training strategy. Intensive search strategy refers to situations where employers use multiple recruitment methods in searching for qualified workers. Training strategy refers to situations where employers use few recruitment methods, but rather train workers once hired. If scarcity of qualified workers persist when most employers use an intensive-search strategy then that indicates a real structural imbalance (i.e., mismatch between job requirements and worker skills). On the other hand, if most employers use the training strategy and spend little on searching then we have a situation where employers accept inexperienced applicants and train them. In such a situation, low occupational preparation of new entrants need not necessarily mean a general lack of qualified people or skill imbalance but a reflection of the recruitment strategy..

Table 14 summarizes employers' frequently used recruitment methods. Classified ads is clearly the most popular used method with 51 percent of employers using it very frequently. The next most frequently used recruitment method is job posting in the firm's office (33 percent). It is also obvious from Table 14 that employers seldom contact a four year college or technical college placement offices. The Wisconsin Job Services Office is also seldom used.

insert Table 14 here

There are two major implications for these findings. First, the findings suggest minimal consultation between employers and training institution regarding recruitment. If employers seldom consult these training institutions for recruitment, they also not get involved in the development of training programs of these institutions. Second, the findings suggest that employers do not exhaust available recruitment alternatives for qualified workers.

A low level of consultation between employers and training institutions in recruitment and the development of training programs hinders eliminating any imbalance between available skills and skill requirements. Such imbalance may partly explain why employers reported the need for additional training in most of the occupations discussed in this report.

The predominant use of classified ads to the near exclusion of other recruitment methods suggests that employers do not invest much in the their search for qualified workers. The lack of qualified workers for some occupations may be due to this minimal search. As a result the absence of qualified workers for some occupations reported in various sectors must be tempered by this lack of exhaustive search.

Summary

1. Fifty-two percent of Wisconsin employers offer half of their formal training internally using the firm's own trainers.
2. Sixty three percent of employers in the state are satisfied with their own internal training facilities.
3. A third of the employers surveyed are willing to pay outside institutions to train their workers. This includes those who are not satisfied with their training facilities as well as those who are satisfied but probably need extra training.
4. Most employers rely more on classified ads and less on other recruitment methods to announce available positions.

The policy implications of these findings are as follows. First, the active involvement of employers in their own in-house formal training suggests that traditional institutions responsible for offering formal training are not delivering the students employers are seeking. A probable solution to this dilemma requires the active cooperation between employers, educational institutions, and recently hired workers. In this regard, increasing use of flexible work-study training programs in which instructors encourage student workers to identify problems encountered in their work and bring them to the class for group solution is recommended. A comment by one respondent "...most ...training does not devote enough time to troubleshooting. New kids aren't willing to see a problem to the end. If the answer is not in a book they're lost and give up." This comment, isolated as it may seem, suggests that areas traditional formal training may not cover may be the areas of critical concern to the employer.

Second, active cooperation between employers and educational institutions placement offices is strongly recommended to facilitate the match between available skills and skill requirements.

APPENDIX I

I. EMPLOYER INFORMATION

Q-1. Number of employees in this location ________________.

Q-2. Please indicate your position in this firm.

( ) President | Chief Executive Officer

( ) Finance Director

( ) Personnel Director

( ) Other (please specify) ____

II. CHANGES IN LABOR FORCE

We would like to ask you some questions about your workforce. For the purpose of this survey we focus mainly on the occupations listed under the questions below. However, if there are other occupations you wish to include because of their special significance to any of the questions you may do so.

Q-3. Please indicate the number of permanent full-time or full-time equivalent (FTC) workers employed in your firm in the following occupations as of 30th September 1987 and also the number employed as of 30th September 1988. Please do not include temporary employees. (Fill number in the blank; if none, write "0".)

OCCUPATION	NUMBER EMPLOYED AS OF 30TH SEPTEMBER 1987	NUMBER EMPLOYED AS OF 30TH SEPTEMBER 1988
1) [SEE APPENDIX II	________	________
2) FOR SECTOR DETAIL	________	________
3) ON OCCUPATIONS]	________	________
4)	________	________
5)	________	________
6)	________	________

Q-4. Over the next twelve months, do you anticipate an increase, decrease, or no change in the current number of your firm's permanent employees in the occupations listed below? (Please circle the correct response for each occupation.)

OCCUPATION	INCREASE	NO CHANGE	DECREASE
1)	3	2	1
2)	3	2	1
3)	3	2	1
4)	3	2	1
5)	3	2	1
6)	3	2	1

III. OCCUPATIONAL PREPARATION AND RECRUITMENT

We would like to ask you questions on how your employees are recruited and how well prepared newly hired employees are in terms of the skills needed to do their jobs.

Q-5. Please circle the response that best describes the frequency with which different recruitment methods were used by your firm in the past twelve months.

RECRUITMENT METHOD	VERY FREQUENT	FREQUENT	NOT FREQUENT	NOT AT ALL
1)	4	3	2	1
2)	4	3	2	1
3)	4	3	2	1
4)	4	3	2	1
5)	4	3	2	1
6)	4	3	2	1
7) ______________________________	4	3	2	1

Q-6. Please indicate how you would rate the overall occupational preparation of newly hired employees in your firm over the past twelve months, with 4 - very well prepared and 1 - not well prepared. (Please circle the correct response for each occupation.)

OCCUPATION	VERY WELL PREPARED			NOT WELL PREPARED
1)	4	3	2	1
2)	4	3	2	1
3)	4	3	2	1
4)	4	3	2	1
5)	4	3	2	1
6)	4	3	2	1

IV. SKILL AVAILABILITY

In this section we would like to ask questions about skill availability. We would also like to ask questions about how labor scarcity problems are resolved by your firm.

Q-7. Over the past twelve months has your firm had any difficulty finding qualified people for the occupations listed below? (Please circle the appropriate response for each occupation.)

OCCUPATION	YES	NO	DID NOT HIRE
1)	3	2	1
2)	3	2	1
3)	3	2	1
4)	3	2	1
5)	3	2	1
6)	3	2	1

Q-8. If your firm has had difficulties in recruiting the qualified personnel needed, what long term strategies have you attempted to use to resolve the difficulty? (You may circle more than one response for each occupation. If you have had no difficulties, then circle "No Problem.")

OCCUPATION	PROMOTED EXISTING PERSONNEL	INCREASED OVERTIME	REDESIGNED JOBS	TRANSFERS WITHIN FIRM/ORGANIZATION	EXPANDED OWN TRAINING EFFORT	RAISED WAGE OFFERS	DELAYED EXPANSION	OTHER (specify) ________ ________	NO PROBLEM
1)	1	2	3	4	5	6	7	8	9
2)	1	2	3	4	5	6	7	8	9
3)	1	2	3	4	5	6	7	8	9
4)	1	2	3	4	5	6	7	8	9
5)	1	2	3	4	5	6	7	8	9
6)	1	2	3	4	5	6	7	8	9

V. EFFECTS OF TECHNOLOGICAL CHANGES

Now we would like to turn to some questions about the introduction of new technologies and their effects on skill levels. (If no new technologies have been adopted in the past two years GO TO Q-13.)

Q-9. Please indicate if your firm has in the past two years introduced or intend to introduce in the next two years any new major technologies in the form of new processes, materials, or machinery such as those described below. Indicate other types of new major technologies not listed here but which you have introduced in the past two years or intend to introduce in your firm in the next two years. (Circle the correct response.)

NEW TECHNOLOGY	INTRODUCED	INTEND TO INTRODUCE	DID NOT AND DO NOT INTEND TO INTRODUCE
1)	3	2	1
2) ______________________________	3	2	1
3) ______________________________	3	2	1
4) ______________________________	3	2	1

Q-10. In a general sense how important were each of the following reasons in your decision to introduce the technologies listed above? (Circle the appropriate response for each reason; 4-very important and 1-not important.)

REASONS	VERY IMPORTANT			NOT IMPORTANT
1)	4	3	2	1
2)	4	3	2	1
3)	4	3	2	1
4)	4	3	2	1
5)	4	3	2	1
6) ____________________	4	3	2	1

Q-11. Fundamental knowledge refers to basic math, science, reading, and writing. Specific technical knowledge refers to the mental, manipulative, and interpersonal skills associated with a particular job. Has the introduction of the new technologies in your firm resulted in an increase, decrease, or no change in the level of fundamental knowledge and/or specific technical knowledge needed by your employees. (Please circle the correct response on each type of knowledge for each occupation listed below.)

	FUNDAMENTAL KNOWLEDGE CHANGES NEEDED (BASIC MATH, SCIENCE, READING AND WRITING) (Circle the correct number)			SPECIFIC TECHNICAL KNOWLEDGE NEEDED (MENTAL, MANIPULATIVE AND INTERPERSONAL SKILLS) (Circle the correct number)		
OCCUPATION	INCREASED	NO CHANGE	DECREASED	INCREASED	NO CHANGE	DECREASED
1)	3	2	1	3	2	1
2)	3	2	1	3	2	1
3)	3	2	1	3	2	1
4)	3	2	1	3	2	1
5)	3	2	1	3	2	1
6)	3	2	1	3	2	1

V. WORKFORCE ADAPTATION

In this last section we would like to ask questions about your training and retraining needs. (If you have not introduced any new technologies in the past two years GO TO Q-13.)

Q-12. How important was the need for training and retraining in adapting your existing employees to new technological changes that were introduced? (Please circle the correct response for each occupation.)

OCCUPATION	VERY IMPORTANT			NOT IMPORTANT
1)	4	3	2	1
2)	4	3	2	1
3)	4	3	2	1
4)	4	3	2	1
5)	4	3	2	1
6)	4	3	2	1

ALL RESPONDENTS

Q-13. Over the next twelve months do you anticipate a need for more training or retraining of your current employees? (Please circle the correct response for each occupation.)

OCCUPATION	YES	NO
1)	2	1
2)	2	1
3)	2	1
4)	2	1
5)	2	1
6)	2	1

Q-14. Are any of the following occupational groups in your firm represented by a union or a labor organization? (Please circle the correct response.)

OCCUPATION	YES	NO
1)	2	1
2)	2	1
3)	2	1
4)	2	1
5)	2	1
6)	2	1

Q-15. What types of employee training do you think are most effective for developing or maintaining overall knowledge and skills of your employees? (Circle all the responses that apply for each occupation.)

OCCUPATION	FORMAL IN-HOUSE TRAINING BY FIRMS OWN TRAINERS	FORMAL IN-HOUSE TRAINING BY OUTSIDERS (E.G., CUSTOMIZED TRAINING)	FORMAL OUTSIDE TRAINING (MANUFACTURER OF EQUIPMENT)	FORMAL OUTSIDE TRAINING (OTHER)	ON-THE-JOB TRAINING	OTHER (SPECIFY) ____________
1)	1	2	3	4	5	6
2)	1	2	3	4	5	6
3)	1	2	3	4	5	6
4)	1	2	3	4	5	6
5)	1	2	3	4	5	6
6)	1	2	3	4	5	6

Q-16.How much formal training is offered in-house by your firm's own trainers? (Please circle the appropriate response.)

1. Below 25%.
2. Between 26% and 50%.
3. Between 51% and 75%.
4. Over 75%.

Q-17. Are you satisfied with your firm's in-house training offered by your firm's own trainers? (Circle the appropriate response. If you have no in-house training facility answer "none".)

1. No.
2. Yes.
3. None.

Q-18. Are you considering training facilities that are available elsewhere? (Circle the appropriate response.)

1. No.
2. Yes.
3. Do not offer training.

Is there anything else you would like to tell us about employment and training needs of your firm? If so, please use this space for that purpose. Also any comments you wish to make that you think may help us in the efforts to understand the employment and training needs of Wisconsin employers will be appreciated, either here or in a separate letter.

Your contribution to this effort is very greatly appreciated. If you would like a summary of the results, please print your name and address on the back of the return envelope (Not on this questionnaire). We will see that you get it.

APPENDIX II

STAFFING PATTERN OF INDUSTRIES INCLUDED IN SURVEY*

INDUSTRY SPECIFIC OCCUPATIONAL DATA	PERCENT OF INDUSTRY EMPLOYMENT	AVERAGE EMPLOYMENT IN INDUSTRY 1985	PROJECTED EMPLOYMENT IN INDUSTRY 1995	USUAL EDUCATION REQUIRED	MINIMUM SPECIFIC VOCATIONAL PREPARATION
SIC 357: OFFICE, COMPUTER, AND ACCOUNTING EQUIPMENT	100.0	2,970	3,340		
ALL OTHER ASSEMBLERS, FABRICATOR	49.7	1,480	1,640	Some High School	Short Demo
* MACHINE ASSEMBLERS	16.4	490	570	Some High School	Up to 3 months
* INSPECTORS, TESTERS, AND GRADERS	4.5	140	160	Some High School	Up to 3 months
* ELECTRICAL, ELECTRONIC ASSEMBLER	3.4	100	100	Some High School	1 to 1 years
STOCK CLERKS, STOCKROOM OR WAREH.	2.9	90	80	Some High School	Up to 3 months
** ELECTRICAL & ELECTRONIC ENGINEER	2.1	60	90	College Grad	2 to 4 years
ALL OTHER PROF., PARAPROF., TECHN.	2.1	60	70	Some High School	3 months to 1 yr
JANITORS AND CLEANERS, EXC. MAIDS	1.8	50	60	Some High School	Up to 3 months
GENERAL MANAGERS AND TOP EXEC.	1.7	50	60	Some College/Tech	1 to 2 years
SALES REPS,SCIENTIF.PROD.EXC.RET.	1.7	50	60	Some College/Tech	3 months to 1 yr
* ALL OTHER SECRETARIES	1.7	50	60	Some College/Tech	Up to 3 months
TRAFFIC, SHIPPING, & REC. CLERKS	1.7	50	50	Some High School	Up to 3 months
MAINTENANCE REPAIRERS, GEN.UTIL.	1.7	50	60	High School Grad	2 to 4 years
** ELECTRICAL & ELECTRONIC TECHNS.	1.5	40	60	High School Grad	1 to 1 years
* WELDING MACHINE OPERATORS	1.4	40	50	Some High School	Up to 3 months
SIC 361: ELECTRICAL DISTSRIBUTING EQUIPMENT	100.0	5,930	6,480		
ALL OTHER ASSEMBLERS, FABRICATOR	14.2	840	910	Some High School	Short Demo
* ELECTRICAL, ELECTRONIC ASSEMBLER	10.3	610	660	Some High School	1 to 1 years
* COIL WINDERS, TAPERS, FINISHERS	8.6	510	560	Some High School	Up to 3 months
ELECTRICAL, ELECTRONIC ASSEMBLER	4.5	270	280	Some High School	Up to 3 months
* INSPECTORS, TESTERS, AND GRADERS	3.7	220	250	Some High School	Up to 3 months
FIRST LINE SUPERV.: PRODUCTION	3.4	200	220	Some High School	3 months to 1 yr
PRODUCTION INSPECTORS, GRADERS	3.4	200	220	Some High School	Short Demo
** ELECTRICAL & ELECTRONIC ENGINEER	2.7	160	210	College Grad	2 to 4 years
* WELDERS AND CUTTERS	2.3	140	150	Some High School	Up to 3 months
** ELECTRICAL & ELECTRONIC TECHNS.	2.2	130	160	High School Grad	1 to 2 years
** DRAFTERS	2.0	120	130	High School Grad	1 to 2 years
GENERAL MANAGERS AND TOP EXEC.	1.7	100	110	Some College/Tech	1 to 2 years
ALL OTHER HAND MATERIAL MOVERS	1.6	90	100	Some High School	Short Demo
INDUSTRIAL TRUCK & TRACTOR OPER.	1.4	80	80	Some High School	Up to 3 months
ALL OTHER HAND WORKERS	1.3	80	90	Some High School	Short Demo

INDUSTRY	SPECIFIC OCCUPATIONAL DATA	PERCENT OF INDUSTRY EMPLOYMENT	AVERAGE EMPLOYMENT IN INDUSTRY 1985	PROJECTED EMPLOYMENT IN INDUSTRY 1995	USUAL EDUCATION REQUIRED	MINIMUM SPECIFIC VOCATIONAL PREPARATION
SIC 362:	ELECTRICAL IND. APPARATUS	100.0	17,380	19,010		
*	COIL WINDERS, TAPERS, FINISHERS	6.3	1,100	1,200	Some High School	Up to 3 months
*	ELECTRICAL, ELECTRONIC ASSEMBLER	6.2	1,080	1,150	Some High School	Up to 3 months
	ALL OTHER ASSEMBLERS, FABRICATOR	6.0	1,050	1,130	Some High School	Short Demo
**	ELECTRICAL & ELECTRONIC ENGINEER	4.2	730	970	College Grad	2 to 4 years
*	INSPECTORS, TESTERS, AND GRADERS	4.0	700	780	Some High School	Up to 3 months
	FIRST LINE SUPERV.: PRODUCTION	3.9	670	730	Some High School	3 months to 1 yr
*	LATHE,TURNING MACH.SETTING/OP,M/P	2.3	390	380	Some High School	3 months to 1 yr
	GENERAL MANAGERS AND TOP EXEC.	2.1	360	390	Some College/Tech	1 to 2 years
*	ALL OTHER SECRETARIES	2.0	350	380	Some College/Tech	Up to 3 months
	ELECTRICAL, ELECTRONIC ASSEMBLER	2.0	350	380	Some High School	1 to 2 years
*	ELECTROMECHANICAL CO. ASSEMLBER	1.9	320	350	Some High School	1 to 2 years
	ALL OTHER MANAGERS & ADMINIST.	1.8	320	370	High School Grad	3 months to 1 yr
**	DRAFTERS	1.8	310	330	High School Grad	1 to 2 years
**	ELECTRICAL & ELECTRONIC TECHNS.	1.7	300	380	High School Grad	1 to 2 years
	MACHINE ASSEMBLERS	1.7	290	330	Some High School	Up to 3 months
SIC 366:	COMMUNICATIONS EQUIPMENT	100.0	3,510	3,830		
	ALL OTHER ASSEMBLERS, FABRICATOR	29.1	1,020	1,090	Some High School	Short Demo
	ALL OTHER ENGINEERS	7.4	260	310	Some College/Tech	2 to 4 years
	PRODUCTION INSPECTORS, GRADERS	6.0	210	230	Some High School	Short Demo
*	ELECTRICAL, ELECTRONIC ASSEMBLER	4.9	170	180	Some High School	1 to 2 years
	ALL OTHER MECHANICS, INSTALLERS	4.7	160	180	Some High School	Up to 3 months
	FIRST LINE SUPERV.: PRODUCTION	4.2	150	160	Some High School	3 months to 1 yr
*	ELECTRICAL, ELECTRONIC ASSEMBLER	2.6	90	100	Some High School	Up to 3 months
	ALL OTHER MACHINE SETTERS/OPER.	2.5	90	100	Some High School	Up to 3 months
	ALL OTHER HELPER, LABORER, MOVER	2.2	80	80	Some High School	Up to 3 months
*	GENERAL OFFICE CLERKS	2.0	70	70	Some High School	Up to 3 months
*	INSPECTORS, TESTERS, AND GRADERS	2.0	70	80	Some High School	Up to 3 months
**	ELECTRICAL & ELECTRONIC TECHNS.	1.5	50	70	High School Grad	1 to 2 years
*	TOOL AND DIE MAKERS	1.4	50	50	High School Grad	1 to 2 years
	JANITORS AND CLEANERS, EXC.MAIDS	1.4	50	60	Some High School	Up to 3 months
	GENERAL MANAGERS AND TOP EXEC.	1.3	50	50	Some College/Tech	1 to 2 years
*	COMBINATION MACH.TOOL SET/OP,M/P	1.3	50	60	High School Grad	3 months to 1 yr

APPENDIX II (Continued)

INDUSTRY SPECIFIC OCCUPATIONAL DATA		PERCENT OF INDUSTRY EMPLOYMENT	AVERAGE EMPLOYMENT IN INDUSTRY 1985	PROJECTED EMPLOYMENT IN INDUSTRY 1995	USUAL EDUCATION REQUIRED	MINIMUM SPECIFIC VOCATIONAL PREPARATION
SIC 381:	ENGINEERING, LAB, RES. INSTRUMENTS	100.0	2,810	3,270		
*	PRECISION INSTRUMENT REPAIRERS	12.0	340	400	Some High School	Up to 3 months
**	ELECTRICAL & ELECTRONIC TECHNS.	9.9	280	370	High School Grad	1 to 2 years
*	SALES REPS,SCIENTIF.PROD.EXEC.RET	7.4	210	240	Some College/Tech	3 months to 1 yr
*	MACHINE FEEDERS AND OFFBEARERS	7.4	210	250	Some High School	Short Demo
*	ELECTRICAL, ELECTRONIC ASSEMBLER	7.2	200	230	Some High School	Up to 3 months
	GENERAL MANAGERS AND TOP EXEC.	5.5	150	180	Some College/Tech	1 to 2 years
	ALL OTHER ASSEMBLERS, FABRICATOR	5.5	150	170	Some High School	Short Demo
	ALL OTHER SECRETARIES	4.4	120	140	Some College/Tech	Up to 3 months
*	BOOKKEEPING & ACCOUNING CLERKS	3.6	100	110	Some High School	Up to 3 months
	FIRST LINE SUPERVISORS, CLERICAL	3.3	90	110	Some High School	3 months to 1 yr
**	DRAFTERS	3.3	90	110	High School Grad	1 to 2 years
	FIRST LINE SUPERV.: PRODUCTION	3.3	90	110	Some High School	3 months to 1 yr
**	COMPUTER PROGRAMMERS	3.0	90	100	Some College/Tech	2 to 4 years
**	ELECTRICAL & ELECTRONIC ENGINEER	2.7	80	110	College Grad	2 to 4 years
	TYPISTS	1.9	50	50	High School Grad	3 months to 1 yr
	TYPISTS, WORK PROCESSING EQUIP.	1.6	50	50	High School Grad	3 months to 1 yr
SIC 632:	ACCIDENT & HEALTH INSURANCE PLANS	100.0	6,700	7,660		
**	INSURANCE ADJUSTERS,INVESTIGATOR	19.1	1,280	1,530	Some College/Tech	3 months to 1 yr
	ALL OTHER CLERICAL & ADM.SUPPORT	6.9	460	540	Some High School	Up to 3 months
*	GENERAL OFFICE CLERKS	4.8	320	350	Some High School	Up to 3 months
*	INSURANCE CLAIMS CLERKS	4.0	270	300	High School Grad	3 months to 1 yr
	FIRST LINE SUPERVISORS, CLERICAL	4.0	270	310	Some High School	3 months to 1 yr
*	DATA ENTRY KEYERS, EX. COMPOSING	4.0	270	230	Some High School	Up to 3 months
	ALL OTHER MANAGERS & ADMINIST.	3.4	230	280	High School Grad	3 months to 1 yr
*	ALL OTHER SECRETARIES	3.3	220	250	Some College/Tech	Up to 3 months
*	CORRESPONDENCE CLERKS	3.3	220	250	High School Grad	3 months to 1 yr
*	BOOKKEEPING & ACCOUNTING CLERKS	3.3	220	240	Some High School	Up to 3 months
**	INSURANCE SALES WORKERS	3.2	210	240	Some College/Tech	3 months to 1 yr
	ALL OTHER MANAGEMENT SUPPORT OCC	3.2	210	280	Some High School	Up to 3 months
**	ACCOUNTANTS AND AUDITORS	3.0	200	260	College Grad	1 to 2 years
*	FILE CLERKS	3.0	200	190	Some High School	Up to 3 months
	ALL OTHER OFFICE MACH. OPERATORS	2.5	170	190	Some High School	Up to 3 months
	ALL OTHER FINANCIAL SPECIALISTS	2.2	150	170	Some College/Tech	3 months to 1 yr

INDUSTRY	SPECIFIC OCCUPATIONAL DATA	PERCENT OF INDUSTRY EMPLOYMENT	AVERAGE EMPLOYMENT IN INDUSTRY 1985	PROJECTED EMPLOYMENT IN INDUSTRY 1995	USUAL EDUCATION REQUIRED	MINIMUM SPECIFIC VOCATIONAL PREPARATION
SIC 736:	PERSONNEL SUPPLY SERVICES	100.0	16,200	19,560		
	ALL OTHER SERVICE WORKERS	14.3	2,320	3,060	Some High School	Short Demo
	ALL OTHER HELPER, LABORER, MOVER	13.3	2,160	2,660	Some High School	Up to 3 months
**	EMPLOYMENT INTERVIEWERS	13.0	2,110	2,320	College Grad	3 months to 1 yr
*	STOCK CLERKS,STOCKROOM OR WAREH.	10.8	1,750	1,930	Some High School	Up to 3 months
*	GENERAL OFFICE CLERKS	5.4	870	1,030	Some High School	Up to 3 months
**	LICENSED PRACTICAL NURSES	5.0	810	910	Some College/Tech	1 to 2 years
**	REGISTERED NURSES	4.9	790	1,040	Some College/Tech	2 to 4 years
*	ALL OTHER SECRETARIES	4.2	670	820	Some College/Tech	Up to 3 months
	TYPISTS	3.9	620	800	High School Grad	3 months to 1 yr
	ALL OTHER HEALTH PROF.,PARA.TECH	3.1	510	620	High School Grad	3 months to 1 yr
	HAND PACKERS AND PACKAGERS	2.7	440	550	Some High School	Short Demo
	RECEPTIONISTS,INFORMATION CLERKS	2.7	440	520	High School Grad	Up to 3 months
*	TYPISTS, WORD PROCESSING EQUIP.	2.2	350	430	High School Grad	3 months to 1 yr
*	BOOKKEEPING & ACCOUNTING CLERKS	1.5	240	290	Some High School	Up to 3 months
	MAIDS AND HOUSEKEEPING CLEANERS	1.0	170	210	Some High School	Up to 3 months
	ORDER CLERKS: MATERIALS, SERVICE	1.0	150	200	High School Grad	Up to 3 months
SIC 737:	COMPUTER PROGRAMMING, DATA PROCESSING AND OTHER COMPUTER RELATED SERVICES	100.0	6,090	7,350		
*	DATA ENTRY KEYERS, EX. COMPOSING	19.6	1,190	1,080	Some High School	Up to 3 months
**	COMPUTER PROGRAMMERS	19.5	1,190	1,480	Some College/Tech	2 to 4 years
**	COMPUTER SYSTEMS ANALYSTS, EDP	8.9	540	790	Some College/Tech	2 to 4 years
*	COMPUTER OPERATORS, EXC. PERIPH.	4.8	300	390	High School Grad	1 to 2 years
**	ELECTRICAL & ELECTRONIC TECHNS.	3.9	240	340	High School Grad	1 to 2 years
*	COMPUTER PROGRAMMER AIDES	3.0	180	230	Some College/Tech	3 months to 1 yr
*	ALL OTHER SECRETARIES	3.0	180	230	Some College/Tech	Up to 3 months
*	BOOKKEEPING & ACCOUNTING CLERKS	2.9	180	210	Some High School	Up to 3 months
	ALL OTHER CLERICAL & ADM.SUPPORT	2.5	150	190	Some High School	Up to 3 months
	MARKETING, ADV., PUBLIC REL.MGRS	2.5	150	190	High School Grad	1 to 2 years
	FINANCIAL MANAGERS	2.3	140	180	Some College/Tech	2 to 4 years
	ALL OTHER PROF.,PARAPROF.,TECHN.	2.2	130	170	Some High School	3 months to 1 yr
	SALES AGENTS, BUSINESS SERVICES	2.1	130	160	High School Grad	Up to 3 months
	WRITERS AND EDITORS	2.1	130	160	Some College/Tech	1 to 2 years
	DATA PROCESSING EQUIP. REPAIRERS	2.0	120	170	High School Grad	1 to 2 years

APPENDIX II (Continued)

INDUSTRY SPECIFIC OCCUPATIONAL DATA	PERCENT OF INDUSTRY EMPLOYMENT	AVERAGE EMPLOYMENT IN INDUSTRY 1985	PROJECTED EMPLOYMENT IN INDUSTRY 1995	USUAL EDUCATION REQUIRED	MINIMUM SPECIFIC VOCATIONAL PREPARATION
SIC 805: NURSING AND PERSONAL CARE	100.0	36,980	44,650		
* NURSING AIDES AND ORDERLIES	43.5	16,090	20,040	Some High School	Up to 3 months
** LICENSED PRACTICAL NURSES	9.4	3,480	4,400	Some College/Tech	1 to 2 years
** REGISTERED NURSES	7.1	2,610	3,130	Some College/Tech	2 to 4 years
FOOD PREPARATION WORKERS	6.9	2,560	2,960	Some High School	Short Demo
MAIDS AND HOUSEKEEPING CLEANERS	5.5	2,040	2,440	Some High School	Up to 3 months
* COOKS, INSTITUTION OR CAFETERIA	3.0	1,120	1,290	Some High School	3 months to 1 yr
* LAUNDRY, DRYCLEANING MACH. OPER.	2.2	800	920	Some High School	Up to 3 months
SIC 806: HOSPITAL	100.0	75,860	90,386		
** REGISTERED NURSES	22.2	16,875	23,465	Some College/Tech	2 to 4 years
* NURSING AIDES AND ORDERLIES	11.8	8,969	8,751	Some High School	Up to 3 months
** LICENSED PRACTICAL NURSES	8.1	6,110	6,435	Some College/Tech	1 to 2 years
MAIDS AND HOUSEKEEPING CLEANERS	4.1	3,071	3,666	Some High School	Up to 3 months
** MEDICAL/CLINICAL LAB. TECHNOLOGISTS	2.7	2,057	2,175	Some College	2 to 4 years
* FOOD PREPARATION WORKERS	2.3	1,775	2,158	Some High School	Short Demo
* GENERAL OFFICE CLERKS	1.7	1,305	1,420	Some High School	Up to 3 months
FOOD SERVERS, OUTSIDE	1.7	1,269	1,516	Some High School	Short Demo
* ALL OTHER SECRETARIES	1.6	1,238	1,479	Some College/Tech	Up to 3 months

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* Less technology-oriented occupations included in the survey.
** Technology-oriented occupations included in the survey.

Source: Bureau of Labor, Market Information, Department of Industry, Labor, and Human Relations, 1987.

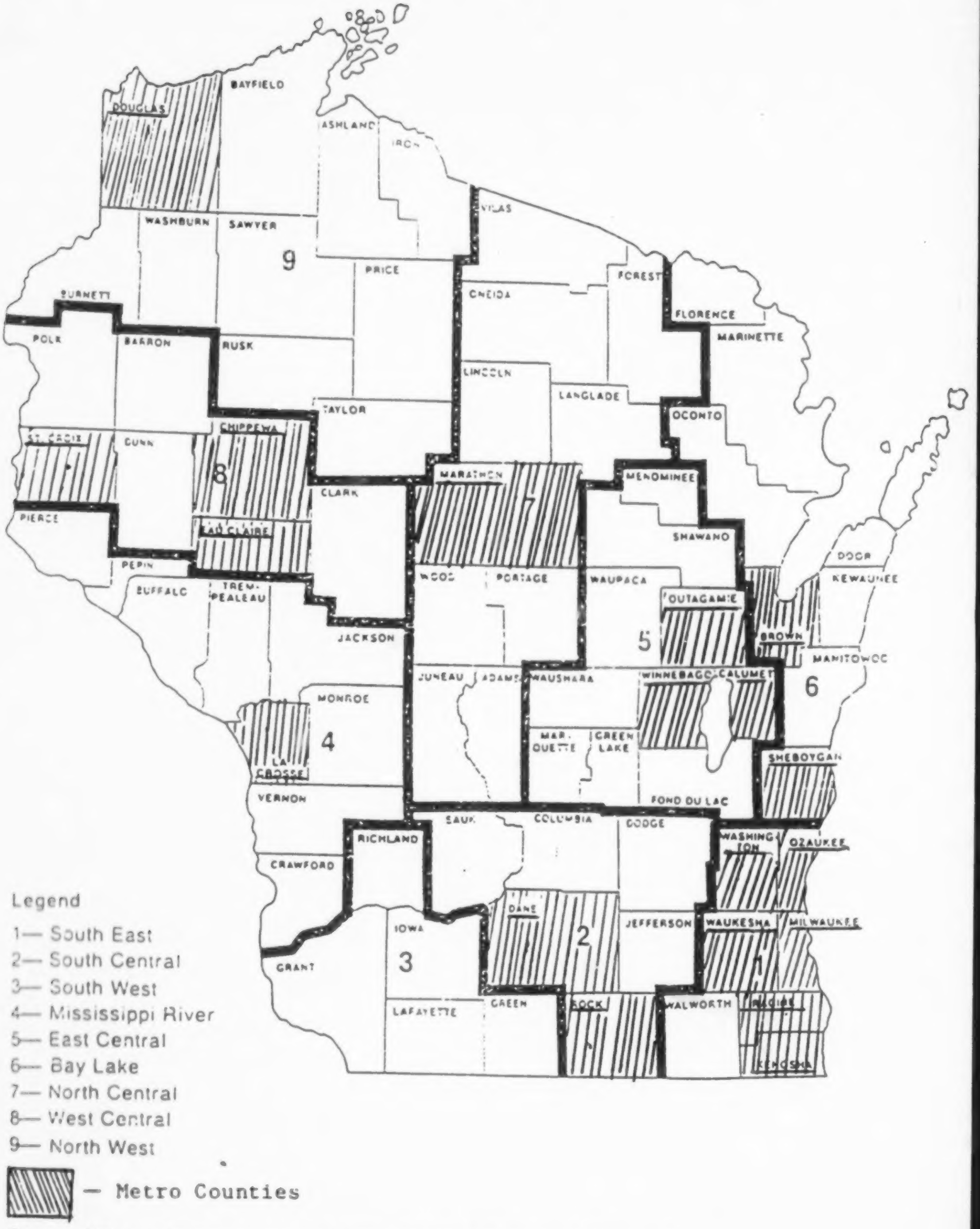
APPENDIX III

OCCUPATION - INDUSTRY MATRIX

		SIC CODES									
OES CODES	OCCUPATIONAL TITLE	357	361	362	366	381	632	736	737	805	806
32502160	Registered Nurse							XXX		XXX	XXX
32505198	Licensed Practical Nurse							XXX		XXX	XXX
25102076	Computer Systems Analyst EPD								XXX		
22126055	Electrical & Electronic Engineer	XXX	XXX	XXX		XXX					
66008401	Nursing Aides and Orderlies									XXX	XXX
22505213	Electrical, Electronic Technician	XXX	XXX	XXX	XXX	XXX			XXX		
56011295	Computer Operator Exc. Periph.								XXX		
53302280	Insurance Adjusters, Investigators						XXX				
25105232	Computer Programmers								XXX		
25108231	Copmuter Programmer Aides								XXX		
2150803	Employment Interviewers							XXX			

XXX Means industry employe workers in the core occupations

APPENDIX IV


DOUGLAS
BAYFIELD
ASHLAND
IRON
VILAS
WASHBURN
SAWYER
9
PRICE
BURNETT
ONEIDA
FOREST
FLORENCE
MARINETTE
POLK
BARRON
RUSK
LINCOLN
LANGLADE
TAYLOR
OCONTO
ST. CROIX
DUNN
CHIPPEWA
8
MARATHON
7
MENOMINEE
CLARK
PIERCE
EAU CLAIRE
SHAWANO
PEPIN
DOOR
BUFFALO
TREM-
PEALEAU
WOOD
PORTAGE
WAUPACA
OUTAGAMIE
KEWAUNEE
BROWN
5
JACKSON
MANITOWOC
JUNEAU
ADAMS
WAUSHARA
WINNEBAGO
CALUMET
6
MONROE
4
LA
CROSSE
MAR-
QUETTE
GREEN
LAKE
SHEBOYGAN
VERNON
FOND DU LAC
SAUK
COLUMBIA
DODGE
RICHLAND
WASHING-
TON
OZAUKEE
CRAWFORD
DANE
2
JEFFERSON
WAUKESHA
MILWAUKEE
IOWA
3
GRANT
1
LAFAYETTE
GREEN
ROCK
WALWORTH
RACINE
KENOSHA

Legend
1— South East
2— South Central
3— South West
4— Mississippi River
5— East Central
6— Bay Lake
7— North Central
8— West Central
9— North West
▨ — Metro Counties

Source: Wisconsin Department of Development, Bureau of Research
U.S. Departmentof Commerce, Bureau of Census

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